The Gardens' Bulletin
STRAITS SETTLEMENTS

Vol. III Issued August, 1923. Nos. 1—3

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Branched coconut palm at Bachok, Kelantan.
From a photograph sent by Mr. F. G. Crosste.

THE

GARDENS' BULLETIN,

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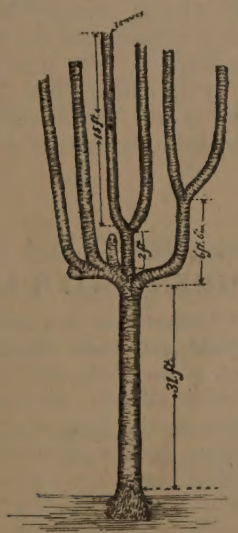
Vol. III Issued August 1923 Nos. 1—3.

THE FERTILITY OF BRANCHED COCONUT PALMS.

In a paper in the *Annals of Botany,* xxi, 1907, p. 420, Mr. H. N. Ridley gave an account of an abnormally branched coconut palm standing upon Perseverance Estate in Singapore island. This tree which is figured upon his plate xxxvi, he was told had never fruited: and the idea that branched coconut-palms are sterile, seems to be general: but it is not absolutely true. Reports of fertile branched coconut palms in New Guinea and in the West Indies have been noticed, and the matter is discussed in Hunger's *Cocos nucifera* (2nd Edition, Amsterdam, 1920) pp. 218-226.



At Geylang on land adjoining the Perseverance Estate there stands at the present time a forked coconut palm. It is sterile now, but is said to have borne fruit.

In Penang island upon a coconut plantation near Tanjong Bunga stands a palm branched as in the annexed drawing by Mr. Mohamed Haniff. It has seven branches and the stumps of two additional ones. Mr. Mohamed Haniff has ascertained that all the fully crowned branches are fertile, and the palm is fruiting now. The tree is said by an old Malay on the Estate to be 45 to 50 years in age.

Mr. Frank G. Crosslé has supplied the following information and the photograph reproduced here of a branched coconut to which the following relates "The tree is upon the outskirts of the village of Bachok, Kelantan. It is said that once it had fourteen branches, and that five have died off: the stumps of two of these can still be seen. The height is approximately 25 feet high from the ground to the place where it divides. It has now started to bear fruit, three nuts on three different branches, which have matured."

Mr. Crosslé continues that he has heard of several branched coconut-palms before, and knows one at Kretay in Trengganu, but that he has never heard of one bearing fruit.

Further information upon branched trees occurring elsewhere would be valued.

I. H. Burkill.

BRANCHING IN ARENGA PINNATA.

A young palm of *Arenga pinnata* Merr. (*A. saccharifera* Labill.) planted out as a replacement in the Arenga Avenue of the Botanic Gardens suffered in 1920 injury to its terminal bud. This bud was replaced by an axillary bud from one of the uppermost axils, and that bud is now commencing to produce a trunk. The possibility of this palm branching has not been recorded before.

I. H. Burkill.

AN EXPERIMENT WITH LETTUCES.

In the end of 1921 lettuce-seed of a number of different races was ordered from England and from France, with the object of ascertaining the best races for local cultivation. The seed duly arrived,—twelve races from Messrs. Sutton and Sons, Reading, England, and 15 races from the firm of Vilmorin-Andrieux and Co., Paris. Of the english races eight were cabbage lettuces and four cos lettuces; and of the french races twelve were cabbage lettuces and three cos. The seeds were sown on November 21st. in a mixture of sand and burned earth, and germination was very satisfactory in forty-eight hours. When the seedlings were 2—3 inches high,—that was in 7—9 days,—they were transplanted into beds, care being taken to do it only when the sun was off the beds,

and set out in rows nine inches apart. A fortnight later they were manured by pouring an emulsion of cow-dung into runnels between the rows. In 41-44 days they were mature, the maximum weight being five ounces.

The lettuces were then sent out in pairs to friends willing to endeavour to judge their table value, each pair with a voting paper. These voting papers showed that the english race was preferred to the french in four cases, and the french to the english in one, while as regards the others the votes cast were roughly equal. The four races of english origin judged better than the french race against which each was pitted, were:—Sutton's Golden Ball, Standwell, Improved Tom Thumb and Satisfaction: the french race judged better than its english competitor was Vilmorin's All-the-year round.

On the whole it appears that from the salad standpoint only races favoured in England are a little better suited to Singapore than races favoured in France.

The races named above are not the only races which did satisfactorily. Sutton's Heartwell, Whiteheart Ideal, and Nonsuch made good in growth, as also did Vilmorin's Large White Stone, Balloon, Neapolitan, Green Madrid and May King.

The experiment, however, must not be considered as final. The chinese cook comes in, and the way in which he served the trial lettuces must have varied. Few know just how a lettuce should be treated, and the cook is not one of them. A lettuce for salad should be allowed just to get flaccid, then an hour before serving it should be plunged into pure cool water, which it will take up the more greedily for the flaccidity and it will be the crisper and better when eaten. But at any rate the chinese cook would treat both competing lettuces with equal disregard to their best.

J. Lennon.

A SPINY YAM FROM SUMATRA.

In the whole vegetable kingdom there are very few instances of the conversion of roots into spines, and these almost without exception in Monocotyledons; *e.g.*, some palms, one of the Iridaceae and a few species of Dioscorea such as *D. esculenta* and *D. prehensilis*.

A new and divergent instance is now added in the undescribed Dioscorea from Sumatra which is here figured. This Dioscorea converts the roots arising on its tubers into spines, and they may cover the whole surface; thus it wears an armour against the depredations of wild pigs etc. It is otherwise with the Asiatic *Dioscorea esculenta* and the African *D. prehensilis* where the spines are the lateral rootlets of long specialised roots produced above the yam and distributed around it in a way that would on the whole

seem to be more effective, because the spines persisting from the year before protect the succulent root of the new year; but the interest of a different method of getting cover is not reduced thereby.

I. H. Burkill.

TAHITIAN YAMS.

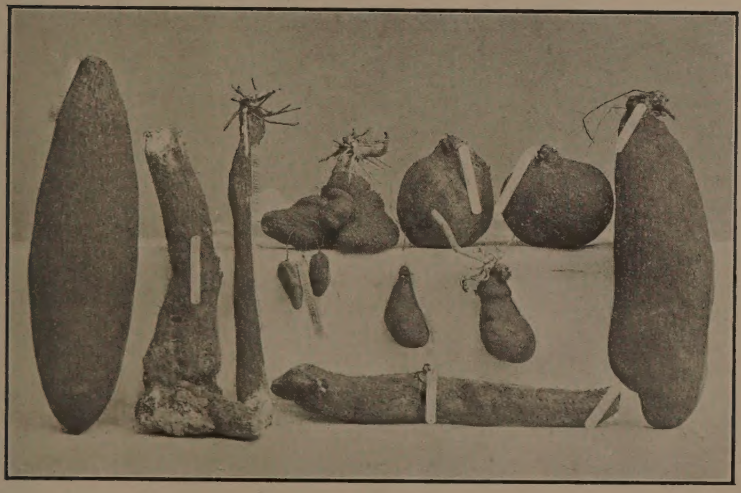
The statement made in this Bulletin vol. I, 1917, p. 396, that *Dioscorea esculenta* does not penetrate the Pacific to the eastward of Fiji is now proved incorrect. Its tubers have been sent to Singapore by the great kindness of Professor Harrison Smith; who has supplied also all the other yams which he could get wild or cultivated in the neighbourhood of Papeete. They are figured upon the accompanying plate.

The great yam, *Dioscorea alata*, Linn. is the most important to the Tahitians of these roots. They grow it in several races, such as *ufi taho-taho* (No. 1 on the plate) and *ufi opura* (No. 10), both being large rather long yams, as *ufi mene-mene* (Nos. 4 and 5) which has neat round tubers, as *ufi tiauu* (No. 9) which is long and deep going, and as *ufi paparatea* (No. 2) which is very long and deep going.

The first crop raised in Singapore from these showed above ground differences between *ufi taho-taho* and *ufi opura* in the frills on the angles of the stems, the first having them green and the second having them purple, in a slight earliness in *ufi taho-taho*, and in the lobes of its leaves being larger less rounded and somewhat uprising in comparison with those of *ufi opura*. There were three tubers got from each, the largest of *ufi taho-taho* weighing 5525 grammes, and the smallest 2607 grammes (average 3957 grammes) the largest of *ufi opura* weighing 4590 grammes, and the smallest 2352 grammes (average 3825 grammes). *Ufi paparatea* returned an average of 3230 grammes; *ufi tiauu* of 2230 grammes; and *ufi mene-mene* of 2253 grammes.

No. 6 in the plate are tubers of *Dioscorea esculenta*, Burk.,— the lesser yam, which Professor Harrison Smith obtained with the name *ufi hoi*. Further *Dioscorea bulbifera*, Linn., (No. 3 on the plate) was given to him under the same name, with the explanation that whereas the first is edible, the latter relatively is not. It is most interesting that the edible and the relatively inedible should not have been distinguished by name; and it would seem therefore that the first though edible is really a very little known and used food. Again the name is interesting for *ufi* and *hoi* both have the meaning "Yam" and nothing more, in the centres of their use: and the Tahitian when he says *ufi hoi* says yam-yam in two different, but closely related, languages. This in itself, apart from the confusion of the cultivated with the wild root, suggests a recent introduction of the tuber.

A spiny yam from Sumatra.



1 2 3 4 5
6·6 7 8 10
in two parts. 9

Yams from Tahiti.

Hoi, one may surmise came to the Tahitians from Hawaii, but *ufi* belongs to their language absolutely, being their form of *ubi* or yam in Malay, and certainly represents a very old root in the language as it is in Madagascar as *ofi*.

The last species, *Dioscorea pentaphylla*, Linn., is No. 6 and 8 on the plate. The Tahitians call it *ufi patara* a name to be found in Nadeaud's *Plantes usuelles des Tahitiens*, and possibly a more sought food with those people fifty years ago, which is when Nadeaud was in Tahiti, than now. It grows wild, and does not even in cultivation return more than 1 kilo by weight of tubers.

I. H. Burkill.

YAMS AT THE MALAYA-BORNEO EXHIBITION.

The Malaya-Borneo Exhibition (Singapore, April, 1922) with its agricultural and horticultural objects collected from all parts of the Malay Peninsula, from Sarawak and from Brunei offered an unequalled opportunity of collecting information regarding native crops and was so used. Then at its winding up, through the Committee for the Agri-Horticultural Section exhibitors were persuaded to give many of their exhibits to the Botanic Gardens, notably roots, and from among them a set of yams went into cultivation in the Economic Garden for better study. This is a report upon them.

Of their genus,—the genus Dioscorea,—four species were exhibited in abundance in the following order:—

Dioscorea alata, Linn.—the Greater Yam,
Dioscorea esculenta, Burk.—the Lesser Yam,
Dioscorea hispida, Dennst.—the Gadong,
Dioscorea bulbifera, Linn.:

of all four species there were exhibits from the Malay Peninsula; of the first two from Brunei; and of the first from Sarawak.

Incidentally it was observed that Yam-scale exists in Malacca, Klang, Pahang and Brunei.

The tubers after a preliminary disinfection, were planted on April 21st. They were dug again on January 6th., 1923.

The Greater Yam.

Two races of the Greater yam from Singapore have already been figured in the Gardens Bulletin (vide Plate III in the issue of March 31st, 1917, Vol. 1, part 11-12) being what are called in the markets of the town Ubi nasi (rice yam) and Ubi merah (red yam). It was known before the Exhibition occurred that both these races are cultivated also near Klang, and that Ubi merah comes freely into Malacca town from the country behind it. It was therefore not surprising to find the race commonly sold in

Singapore as "Ubi nasi" on exhibition from Klang. It is a heavy-yielder, and three hills cultivated in the Botanic Gardens from the Klang specimen returned 13 lbs., 8 lbs. 2 oz., and 6 lbs. respectively.

This Ubi nasi grows to 18 inches or more in length, and for most of the Peninsula seems to be the deepest going yam that is cultivated. But in the Exhibition from Sungei Terap, Kinta district, a chinese cultivator exhibited a single root of one of those races which go still deeper, and which do not seem to be in favour for the soil and with the cultivator in this country, though they usually have a greater delicacy. It was interesting to learn thus that deep-going yams, though scarce, exist.

Judging by the Exhibition, the yams which find favour in the Peninsula are such as are represented on the upper block of the attached plate. They may be circular in section as those upon the upper line, or flattened as those in the lower: when they are flattened, they are also lobulate as the illustrations show. Races characterised by producing tubers that are circular in section were exhibited from Klang, Malacca, and Pekan: races with their tubers flattened and lobed were received from Krian, Kuala Kangsar, Temerloh, Klang and Alor-Gajah. Two of these, one circular from Klang, and one flattened from Temerloh, both without any magenta sap, carried the name ubi nasi, which indeed in general does not signify any particular race, but indicates a tuber of the ordinary downwardly-growing habit which boils white, like rice, as it has no magenta sap in it: the name indeed contrasts with ubi merah. One of the tubers circular in section, but with magenta sap was labelled at Klang ubi java (Java yam), and one of the flattened tubers with magenta sap was labelled at Alor-Gajah ubi paha kerbau (buffalo thigh yam).

It is easily realised that, from a condition in which there is one yam deeply lobed, it is a step to one in which the plant produces more than one tuber. A race producing many neatly rounded small tubers was received from Malacca, which when grown in the Economic Garden returned 24 tubers from three plants.

Ubi sekok from Raub, Pahang, which is the race figured on the upper line of the lower block on the plate, proved to be one of which the exact counterpart had not been seen before: it is without magenta sap, and much branched, but not in one plane only, as is usual.

Of conspicuously flattened and branched yams the Peninsula supplied a single example, namely that figured on the lower line of the lower block on the plate. It came from Klang. As such yams travel badly and are not suitable for sending to a distance, it may be that they are more common in the Peninsula than the Exhibition showed.

Very interesting it was to find from the Peninsula examples of those up-growing yams which require earthing-up in cultivation.

(X) Half-long races of the Greater Yam : on the upper line (left), a race with a tuber circular in section such as seems to find favour in the Malay Peninsula : upper line (right), three tubers of a race from Sarawak with the habit of producing one supplementary horizontal tuber : on the lower line (left) two tubers of a flattened and lobed yam from Klang which finds favour in the Peninsula, and (right) three tubers of a still more lobed race received from Krian.

(Y) Upper line, a peculiarly branched race of the Greater Yam sent from Raub with the name of Ubi sekok ; and below (left) two tubers a flattened very smooth race from Brunei, and (right) a much flattened and branched race from Klang.

SOME YAMS OF THE MALAY PENINSULA AND BORNEO.

They came from Kuala Lipis, from Krian and from Klang. The exhibitor at Kuala Lipis attached the name Ubi junjong to his exhibit. Junjong is among other things, the stake that a climber is grown up, and the name may be translated pole yam, the word "pole" being used exactly as in Pole bean. The exhibitor at Klang attached the name ubi ular (or snake yam) to what he sent. This name— ubi ular— is the name which Rumpf between 1628 and 1702, obtained in Amboina for the same type of yam, and is so appropriate that it would persist anywhere where the malay language is spoken. The Klang ubi ular differed slightly from the others in possessing a diminished tendency in the snake-like roots to curve upwards and extrude from the ground, and had no magenta sap.

These snake yams yield well; and ten hills of the Krian and Kuala Lipis race returned nearly fifty lbs. of tubers, one reaching 7 lbs., while nine hills of the Klang race yielded 64 lbs., one attaining 13½ lbs.

Malacca sent a race producing several tubers to each hill, and these subglobose. Upon the average there were eight to each hill.

From Sarawak came a yam which agrees in character with the commoner lobed yams of the Malay Peninsula, and another much flattened and branched like an open hand which has nothing precisely in common with any of the hitherto known Peninsular races.

From Brunei came another race with the flattened lobed tuber, the lobes widely divergent, figured on the lowest line of the plate. All these three carried magenta sap.

The Lesser Yam.

The Lesser Yam was exhibited in two races from Machap in the Alor-Gajah division of Malacca, and also from Klang. Both of these carry thorns upon the specially defensive roots and therefore belong to that group of races which have been called collectively "spinosa." They both produced 6-12 tubers rather closely bunched together, much as in that race which is figured in the Gardens Bulletin for March 1917, volume I, part 11-12 upon the top row in plate IX. But they differed markedly in flavour, and differed somewhat in the colour and smoothness of the skin. The one race when cooked gave a mealy or starchy tuber, and its yellow skin was very smooth; the other when cooked gave a harder sweeter tuber, and its light umber skin carried a fair sprinkling of small rootlets. The Klang exhibitor attached the name "ubi torak" to the second.

This second sweeter race was sent also from Brunei.

Gadong.

The tubers of *Dioscorea hispida* are not edible, but can be made to furnish a large quantity of starch, and this under proper preparation is a good food. Consequently they appeared in the

Exhibition among other roots that are eaten, and some of those shown were of great size.

Dioscorea Bulbifera.

This unimportant yam was exhibited from Klang and from Seremban in the variety "sativa," which produces large and numerous edible bulbils at the expense of the root-tuber. The plants raised from the tubers obtained at the Exhibition proved identical, and appear to be not different from the "Otaheiti potato" which has been grown for some forty years in India, reaching India via the Andaman islands, and is known in various islands and shores towards the Pacific. The name Ubi Kastela (Castile yam) found applied to it in Singapore suggests that the Portuguese or the Spaniards had once something to do with its dispersal.

I. H. Burkill.

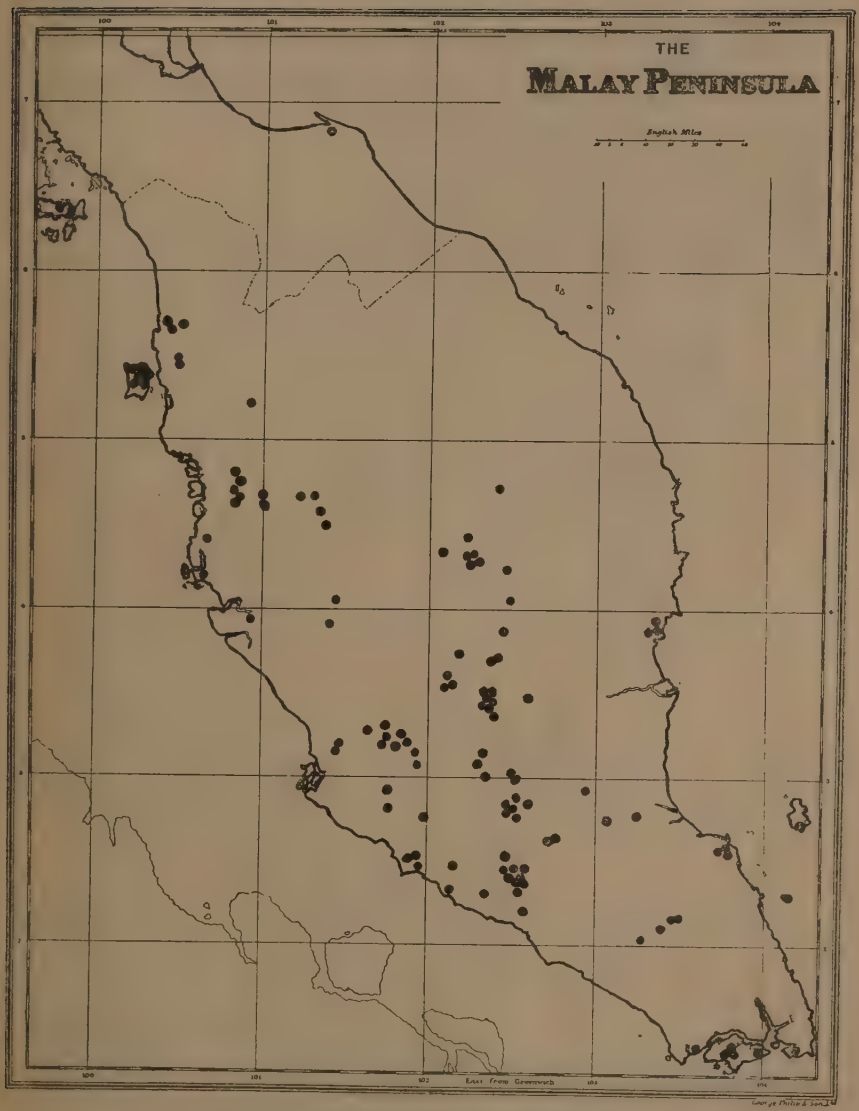
THE AS-YET BOTANICALLY UNEXPLORED PARTS OF THE MALAY PENINSULA.

The object of this note with its two maps is to indicate the parts of the Malay Peninsula which are at present botanically unexplored, and to ask for collections of dried plants from them. One of the maps is of the localities where determined species of the genus *Dipterocarpus* are known to occur; the other is of the localities where determined species of the genus *Dioscorea* are known to occur. The genus Dipterocarpus consists of important forest trees and their economic value has led the Forest Department to pay much attention to them: the genus Dioscorea consists of herbaceous climbers which do not demand attention in the same way: and for that reason the two maps are unlike although there is reason to believe that no wide stretches of the Peninsula are without representatives of either genus. As the maps show, neither genus is known from many parts, and only the one or the other from other parts.

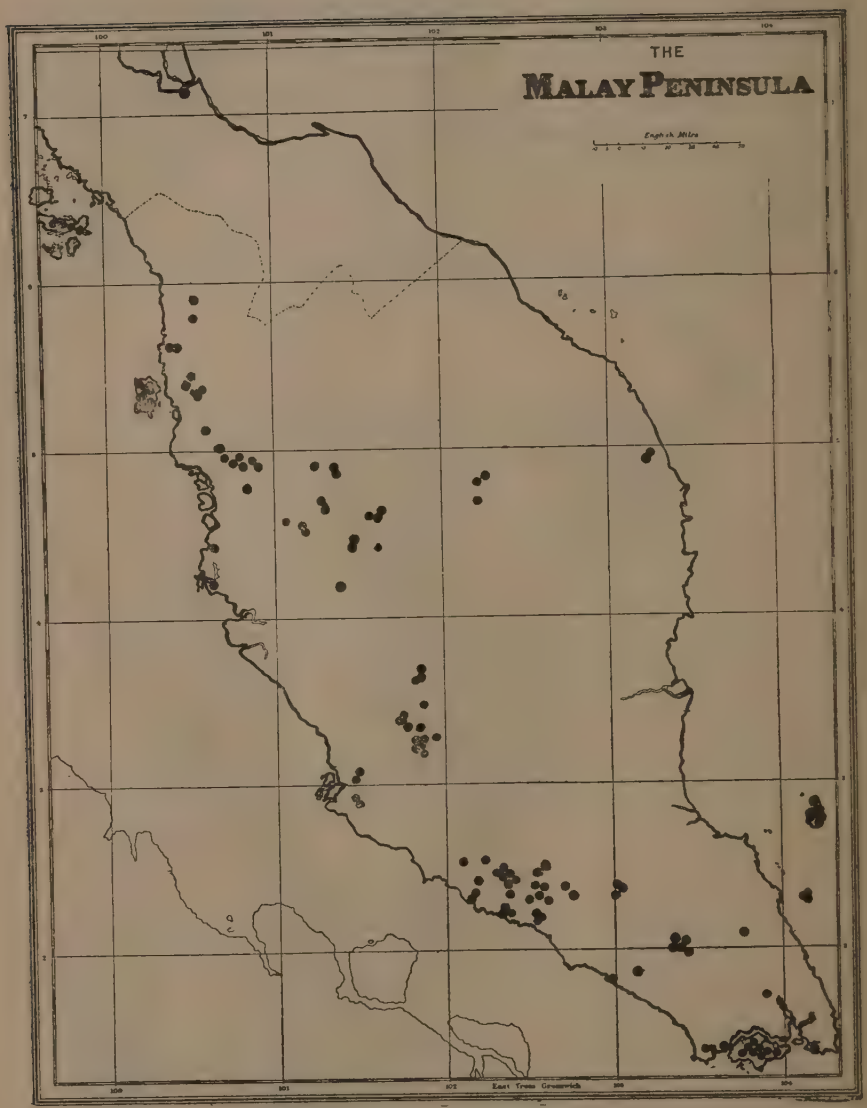
The three Settlements, Penang, Malacca and Singapore, are demonstrated the best studied: after them the parts of Perak about Taiping and north and south of Ipoh; and the parts of Selangor adjacent to Kuala Lumpur: for *Dipterocarpus* Negri-Sembilan and the middle part of the Pahang river have been studied, but not for *Dioscorea*. Large areas of Kedah, the whole of Kelantan and the whole of Trengganu, large areas of Pahang, and also of Johore are without any of the dots that indicate the occurrence of a determined species of either genus.

What is demonstrated in these two maps for the two genera is true of plants of all kinds: Collections of dried plants are wanted from all the blank parts of the maps.

I. H. Burkill.



Known Distribution of Dipterocarpus.



Known Distribution of Dioscorea.

ABNORMAL INFLORESCENCES OF ELAEOCARPUS PETIOLATUS.

In 1921 Mr. Burkill noticed an abnormality in the development of the flowers of a tree of this species growing in the Economic Garden. Some notes were made at the time by Mr. G. B. Deshmukh, who was then Field Assistant at the Gardens. The tree has again produced flowers, and an investigation of them shows a greater complexity in their abnormal features than Mr. Deshmukh records. The unusual points are a complex branching of the inflorescence, accompanied and accentuated by the production of buds in the axils of some or all of the floral organs, and the complete sterilisation of the flowers. The final result is an elaborate branch system bearing minute buds at the apices of its ultimate branchlets. There is some variation of these phenomena in different inflorescences, and an account of these is given below. It is probable that the abnormality is not caused by any stimulation due to insect attack, but is inherent in the nature of the individual tree.

The normal inflorescence of the species is a simple raceme, and some of those on the present tree approximate to this, while others are very much branched before any flowers are produced. The flowers on the less branched inflorescences are of normal size, but in the axils of some or all of the sepals are produced buds, each of which developes into a flower on a pedicel which may reach 4 or 5 cm. in length. The stamens are normal in appearance, but never bear pollen. The axis of the flower continues to grow out above the stamens to a length of 1 to 1.5 cm., carrying some of them, reduced in size, with it. No evidence of the presence of carpels has been observed, but the organs at the apex of the produced axis are too immature to be recognisable. The new flowers are smaller than the original one but behave in the same way, and Mr. Deshmukh records that the process may be repeated four times. During the present flowering very few buds of the third order have been seen, and none of the fourth order. The flowers of each order are smaller than those of the preceding.

The smaller flowers produced by the branchlets of the more complex inflorescences and, to some extent, those of the second and third orders above mentioned show a greater degree of abnormality. The first change is the presence of buds in the axils of petals as well as of sepals. In progressively smaller flowers, on smaller branchlets, additional petals, with or without axillary buds, replace stamens. These small petals are somewhat modified in form, having a less laciniate tip and a few reddish glandular hairs like those on the margins of the sepals. In the smallest flowers of which the organs are not too small to be distinguishable all the stamens (reduced in number) have been replaced by modified petals, and some of these, with axillary buds, are carried above the flower by the continued growth of the axis. When the sepals fall,

the remains of such a flower form a rather modified branch-system of the already complex inflorescence. On the smallest branchlets the reduction in size of the flowers is so great that the floral organs are not differentiated sufficiently to be recognisable.

R. E. Holttum.

ORCHID NOTES.

A New Malayan Orchid,—Dendrobium citrino-castaneum.

This orchid was brought to me by Mr. Poul Feddersen as an epiphyte which he had found near Johore Bahru. It is a typical *Dendrobium* of the section Sarcopodium, falling, in Dr. F. Kränzlin's arrangement of the species of Sarcopodium (Engler's Pflanzenreich, IV, 50, II B. 21, p. 321), near to *Dendrobium elongatum*, Lindl., but being quite distinct from it, and not possessing the affinity to the section *Desmotrichum* which that species has. As one of the Sarcopodiums with rather numerous flowers, and these prettily coloured, it may not be unworthy of cultivation. The duration of the flowers, however, is unknown to me, and possibly it is a little exacting in the conditions of flowering.

Dendrobium (Sarcopodium) citrino-castaneum. *Planta* epiphytica. *Rhizoma* repens, 5 mm. diametro, ab initio vaginis tubulosis pallide virescentibus obtectum, maturitate atro-castaneum, inter pseudobulbos ad 5 cm. longum. *Pseudobulbi* conoidei, glaberrimi, politi, virides, ad 6 cm. longi, ad 2.5 cm. diametro, ex bracteis initio pallide virescentibus, deinde scariosis et atrocastaneis, maturitate liberati, bifoliati. *Folia* obovato-elliptica, ad 14 cm. longa, ad 3.5 cm. lata, glaberrima sed vix polita, firma, apice rotundata vel obtusa, mucronulata, nervis 20 vel ultra inconspicuis, supra saturate viridia, infra pallidiora. *Corymbus* pluriflorus, conspicuus, floribus 6—10: pedicelli cum ovariis 2-4 cm. longi: bracteæ ovato-lineares. *Sepala* citrina; dorsale ad 18 mm. longum, 5 mm. latum, lanceolatum, acutum, 7-nerve: lateralia æquilonga, mentum 6 mm. profundum formantia, ex eodem triangulari-lanceolata, acuta, 6-nervia, nervis 2 supra et nervis 2 infra medium. *Petala* citrina, 16 mm. longa, sepalis paullulo minora, angustiora, concoloria, 5-nervia. *Labellum* ex basi 1.5 mm. lata trilobatum, castaneum; limbus fere planus, crassus, 5 mm. longus: lobus medius exacte linguiformis, crassiusculus, supra sulcatus, 8 mm. longus; lobi laterales oblique oblongi, tenues, apice rotundati atque minutissime denticulati. *Gynostemium* 5 mm. longum.

Johore. Prope Johore bahru, *P. Feddersen.*

Dendrobium callibotrys, Ridl.

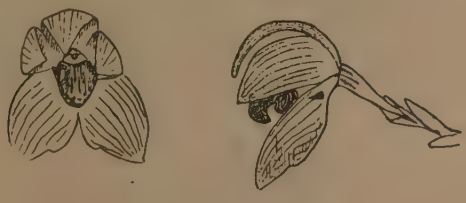
From Gunong Pulai in Johore Mr. G. A. Best recently brought into the Botanic Gardens, Singapore, an orchid which on flowering

appears to be *D. callibotrys*, Ridl.: but as it does not agree with the description in some small points, a note on it is in place. Firstly he said that *D. callibotrys* is an orchid of low levels in Singapore island and adjoining Johore territory, so that the finding of it on Gunong Pulai only extends the range in a measure within expectation.

The raceme of this plant of G. Pulai is 5 cm. long and 9-flowered. The bracts are obovate and at flowering reflexed on to the axis: they are large concave and light green. The sepals and petals are light-yellowish green, not white as is said of the type-plant from Singapore. The dorsal sepal is obovate, obtuse, 9 mm. long: the lateral deltoid-falcate as long: the petals broadly lanceolate obtuse a trifle shorter. The lip is 12 mm. long, very markedly three lobed at the middle and at the base of the side lobes has two lateral warts extended back into crests and one median smaller wart, slightly extended back in a crest, and prolonged forward into a low ridge which runs the length of the mid-lobe: the side lobes stand almost as side walls to the entrance of the flower and are flushed from the tip down with salmon-pink: the mid-lobe is a bright lemon yellow with two grooves down it one on each side of the ridge above mentioned: it is directed obliquely downwards. There is honey; and it has a pleasant faint scent.

The Flowering of Bulbophyllum pustulatum, Ridl.

I received recently from Mr. P. Feddersen a plant of this *Bulbophyllum* with two buds upon it; and I interested myself in observing their expansion. The buds arose from the bases of the lowest two leaf-carrying pseudobulbs, and they flowered one day apart, in the order of their position. The opening of the flower commenced in the afternoon. At noon upon the next day these were as drawn, below, that is to say not yet fully expanded.



Half expanded flowers of *Bulbophyllum pustulatum*, x½.

Full expansion was attained only upon the morning of the third day, and in the afternoon of the same day they began to wither, unfertilised.

The colour is a rather dark amber with crimson veins inside which show translucently through to the outer side, and with a deep crimson fleshy hinged lip, designed to fall forward when an insect alights upon it, thrusting the insect's head against the stigma and the pollinia for the purpose of pollination. The spurs of the

column are light amber, transparent and very firm. The foot is crimson and carries streaks of nectar. The lip has auricles and is hairy below: above it is slightly pitted marginally and with three shallow impressions as the drawing shows upon its face. The crimson sap does not extend through its flesh.

The lip in its natural position: and on the right the pollen masses.

CYMBIDIUM LANCIFOLIUM Hook. in PENANG.

This widely distributed orchid is rare in the Malay Peninsula; and on that account the discovery of it upon Tiger Hill, Penang, by Dr. J. S. Rose and Mr. Mohamed Haniff, is of interest. The species extends from India to Japan, and southwards to Java. In the Peninsula it has been collected on G. Bujong Malaka in the Main range, and on Bukit Sedanan in Malacca and near Nyalas, which are places between the southern termination of the Range and Mt. Ophir.

COELOGYNE CYMBIDIOIDES, Ridl.

This orchid was described by Mr. H. N. Ridley (Jour. Linn. Soc. Lond. Bot., xxxviii, p. 329) from dried herbarium specimens collected by Mr. H. C. Robinson upon Gunong Tahan between 3,000 and 6,000 ft. Its flower is figured here from a living plant brought into the Singapore Gardens by Mr. Mohamed Haniff. The colour is cream and chocolate.

It is one of three Coelogynes of close affinity; viz. *C. dayana*, Reichb. f., *C. densiflora* Ridl., and this. Of the three the first is the most widely distributed, occurring in the Peninsula and in Borneo: in the Peninsula upon the Taiping Hills and on G. Bubu: on the Main range near the Semangkok pass; on Benom; and again on Mt. Ophir. *C. densiflora* occurs on Bukit Etam, and *C. cymbidioides* on G. Tahan. It is a legitimate view to take that the second and the third are subspecies emerging from the more wide *C. dayana*.

Figure of the flower of *C.cymbidioides*, x½

ARACHNIS BREVISCAPA, J. J. Sm.

The two following drawings represent the flower of *Arachnis breviscapa*, J. J. Sm. (Arachnanthe breviscapa, *J. J. Sm.* or

Vandopsis breviscapa, *Schlechter*) an orchid from Sarawak, which flowers in the Botanic Gardens in April. The colour is mustard yellow with umber markings; the lip has umber lines on it and is white at the tip.

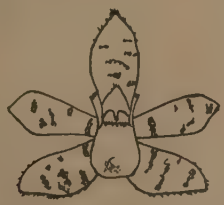
Flower of *Arachnis breviscapa*, in face view and in section, x½.

ASCOCHILUS HIRSUTUS, Ridl., var PORPHYROCHLAMYS.

A pleasing little orchid has recently flowered in the Botanic Gardens, Singapore, which without doubt is to be assigned to *Sarcochilus hirsutus*, Hook. f. (Fl. Brit. Ind., VI, p. 38, and Ann. Roy. Bot. Garden Calcutta, V, p. 44, pl. 67); but having certain peculiarities not found in the type, it is here described as a variety under the name *porphyrochlamys*. Mr. Ridley (Mat. Fl. Malay Peninsula, Monocotyledons. I, p. 179) transferred *Sarcochilus hirsutus* to the genus *Ascochilus* as *A. hirsutus*.

The plant which flowered in Singapore is of uncertain origin.

Its stems ascend obliquely and the solitary inflorescences arise from the axils of lower leaves about to die, standing nearly horizontally, and bearing the flowers in a corymb facing forwards. This means that the twist upon the ovary and pedicel varies in the different flowers. The flowers produced were up to 10 in number, pleasantly fragrant and lasted about four days. They expanded widely as here drawn.



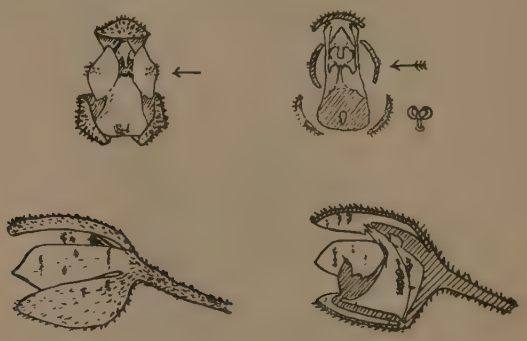
Expanded flower of *Ascochilus hirsutus*, nat size.

The details of the flower are not exactly as in Sir Joseph Hooker's description and drawings; but then he apologises for his work in the following words "Described from the drawing and a very few detached flowers in a very bad state, contained in an attached pocket. The analysis of the lip of the latter was most

difficult and, though conducted with extreme care, I cannot vouch for its perfect accuracy." According to Sir Joseph Hooker's descriptions, the type and this variety differ in the following points:—

Type.	Var porphyrochlamys.
Leaves apparently flaccid and probably drooping	Leaves firm and horizontal on either side of the obliquely ascending stem
Peduncles green suberect	Peduncles purple horizontal
Flowers 2/3 in.	Flowers 1 inch
Dorsal sepal apiculate	Dorsal sepal obtuse
Lip...claw dilating into a cup-like spur:	Lip...claw not dilated into a cup-like spur:
side-lobes or arms of the hypochil wing-like:	side-lobes narrow falcate, even-edged to the toothed apex:
point of spur drawn as elongated.	point of spur very short.

The drawings to which Sir Joseph Hooker referred are those of Kunstler, whose locality is given loosely as "Perak." In the Singapore Herbarium is a drawing of the species made by C. Curtis and localised as from Telok Anson "came with *Phalaenopsis violacea*." It seems that the plant flowered in the Waterfall Gardens. From this source came Mr. Ridley's description in his Materials. The drawing represents the spur at the apex of the labellum as elongated somewhat; and in this respect the plant is as Kunstler's and not as in the var. *porphyrochlamys*. Mr. Curtis represents the hairs on the outside of the flower as reddish purple.



Flower of *Ascochilus hirsutus* expanding.
The same in section; the arrow points to frilled edge of the callus.
Flower of *Ascochilus hirsutus* from the side before expansion.
The same in section.

A New Orchid—Saccolabium crucicallus.

Saccolabium crucicallus is a species brought by Mr. Mahomed Haniff into the Waterfall Gardens, Penang, from Pungah in Lower Siam. It belongs to the section Teretifoliae and suggests the Perak *S. Kunstleri*, Ridl., but in flower is manifestly distinct. It suggests also *S. luisifolium*, Ridl. from Lower Siam.

Saccolabium crucicallus. *Planta* epiphytica. *Caulis* elongatus, pensilis, viridi-purpurascens, 5 mm. crassus, internodiis c. 2 cm. longis. *Folia* teretia, ut cauli 5 mm. crassa, aliquo modo recurvata, minopere versus apicem obtusum contracta, viridia vel purpurascentes, ad 14 cm. longa. *Racemi* ex caule ad latera foliorum enascentes, a caule basi divergentes deindedeflexi versus terram prorsi, ad 15 cm. longi, 25-flori; axis angulatus: pedicelli cum ovariis horizontales, lutescentes. *Sepala* purpureo-brunnea, obtusissima, 4 mm. longa, 2 mm. lata, dorsale quadrato-ovatum; lateralia oblique quadrato-ovata. *Petala* sepalis concoloria, lineari-acuta, 3 mm. longa, 1 mm. lata explanata. *Labellum* cremeum nisi in lobis basalibus ubi luteum: lobi basales rotundati, omnino inflexi: lobi apicales ovati carnosiusculi ad medium inflexi; lobus medius in parte apicali horizontalis, latissime ovatus, obtusus: calcar ob callo cruciformi in ore fere clausum, intra dorso cristatum, lateribus crassum, mellifer, callo in ramo infimo paullulu hirsuto. *Gynostemium* anguste cithariforme, luteum.

Floret mense Septembris in Horto Botanico Penangensi: habitat in collibus prope Pungah, Siam inferioris, *Mohamed Haniff*.

Flower of *Saccolabium crucicallus*, x 2, and the cross shaped callus still more enlarged. W. is the wall of the spur and the arrow indicates the approach to the honey.

Stems more or less pendulous green, but developing a purplish pigment on the exposed side which confused in the eye with the green looks purplish brown, about 5 mm. thick. Leaves about 2 cm. apart, up to 14 cm. long terete as thick as the stem, recurved slightly, in a very slight degree tapered just below the blunt apex, with a little of the purple pigment in them where exposed. Raceme from the side of the leaf, about 15 cm. long and 25-flowered, directed earthwards except in the first few cm. which carry it out from the stem, angled. Pedicels and ovary (at flowering indistinguishable) about 1 cm. long at right angles to the axis yellowish with a few minute purplish markings.

Sepals purplish brown squarely ovate, except for a very slight obliquity in the lateral sepals all three equal, very blunt 4 mm.

long by 2 mm. wide. Lateral petals of the same colour as the sepals linear acute 3 mm. long by 1 mm. wide, standing in the same plane as the sepals *i.e.* at right angle to the ovary. Labellum cream-coloured with bright yellow on the lower of the two pairs of lateral lobes, with a blunt spur 2 mm. long and very faintly bilobed this spur nearly parallel to the ovary and so horizontal. Side lobes bifid, the upper of the two divisions thin circular bent in over the entrances to the spur: the lower of the two pairs ovate slightly fleshy and at first directed forward, but then equally bent in: the mid lobe directed forward very broadly ovate oblate obtuse: interior of the spur with from above a cross-shaped callus hollowed between the points and just hairy upon the lowest point, and from below a curved ridge which impinges upon the back of the callus, while the wall of the spur thickened at either side (W in figure) closes any approach to the honey under the callus. The approach to the abundant honey is thus over the lateral arms of the cross and therefore above the lateral lobes of the lip. An arrow indicates it.

Column yellow slightly fiddleshaped presenting a very slightly hollowed face forwards.

I. H. Burkill.

HAPLOCHOREMA SUMATRANUM.

The late Dr. Karl Schumann defined in 1899 a genus Haplochorema, with then four species from Borneo, to which he added two more from the same island in 1900. He remarked that its affinity was close with *Kaempferia,* but that by having an unilocular ovary, it appeared sharply distinguished from this and from all other genera of the Zingiberaceae to which it belongs. If the character drawn from the ovary holds good then a Sumatran plant now in cultivation in the Botanic Gardens, Singapore, is also a Haplochorema: but it suggests *Gastrochilus* more than *Kaempferia.* The ovary of all the species in these three genera should be examined afresh to decide how they differ and are to be distinguished.

Dr. T. Valeton has already questioned the soundness of Karl Schumann's judgment in regard to an unicellular ovary in a few Zingberaceae marking them off as a genus, and in the *Bulletin du Jardin Botanique de Buitenzorg,* series 2, No. 27, 1918, p. 115, has reminded us that *Curcuma Kunstleri,* Baker, may possess one as an abnormality.

The following is a description of this new Haplochorema.

Haplochorema sumatranum. *Herba* pedalis et ultra, sylvicola. *Rhizoma* breve. *Folia* disticha, 2—4 supra vaginas duas: petiolus ad 12 cm. longus, in dimidio inferiore vaginatus, vaginorum apicibus lanceolatis mox emortuis: lamina late elliptica, apice et basi acuta, araneoso-hirsuta, ad 30 cm. longa, ad 15 cm. lata. *Racemus* 3—5-florus: flores invicem exserti singuli, bracteis

transparentibus cincti, apicibus bractearum brunneo-lineatis. *Sepala* albotransparentia, 1.5 cm. longa. *Corollae* tubus 6—7 cm. longus, albus; petala acuta, inaequalia; dorsale majus anguste triangulari-ovatum, 1.2 cm. longum; lateralia triangulari-lanceolata, 1.4 cm. longa. *Labellum* 1.5 cm., 0.8 cm. latum, basi album, vix bilobatum sed subrotundatum, apice luteum, in medio linea scalariformi notatum. *Staminodia* alba, 1 cm. longa, obovata, apice rotundata. *Staminis* connectivum crista luteo-tincta, dentibus 2—4 parvis latis coronatum: anthera apices deflexi, granas pollinis extendantes. *Ovarium* 6—8-ovulatum; ovula ex basi orta; stigmatis os despiciens.

Habitat in sylvis montis Bukit kramat kuda, prope Sinolangit, in Sumatra: collegit Mohamed Nur sub numero 7258. Colitur in Horto botanico Singapurense.

The flowers of this small herb are not conspicuous; they are produced one at a time close to the ground under the leaves, the bases of the lamina of which they scarcely attain. The raceme is not distichous as are the leaves, but shows an arrangement in three stichies. The ovary is sessile among the transparent bracts, and possesses upwards of eight ascending ovules in its single cavity. The corolla-tube is very long and slender, reaching 7 cm., white, and of the same thickness throughout. The petals are not quite equal, the upper which is inclined to arch over being largest while the other two which lie close together are quite behind the labellum. The labellum is large, and only just bifid at the very tip; in the basal half it is white with a brown ladder-like double stripe down the mid-line not extending into the throat, and in the apical portion it is chrome yellow. The staminodes are white. The connective is bent upon the filament at an angle of 45 degrees; it is crested above by reason of four small teeth.

I. H. Burkill.

A BOTANICAL RECONNAISSANCE UPON THE MAIN RANGE OF THE PENINSULA AT FRASER HILL.

These pages are written under the belief that the following more or less accurately represents the history of the warmth and moisture loving flora of the Malay Archipelago from the Miocene period.

In the Miocene there was a time, or there were times, when very humid conditions prevailed right from the westernmost limits of the Indian Ocean to the Pacific. So long as they prevailed it was possible for plants which can only exist under such conditions, namely the components of a tropical rain forest, to spread through the lands between Africa and the neighbourhood of say New Guinea. But there intruded into this warm and moist climate

drier conditions spreading from the west, which on reaching the Arabian Sea cut off that part of the tropical rain forest flora which is now left in the Mascarene Islands, and on reaching the bay of

Map showing present position of the west wind drift and cold ocean current, causing dry climate in Western Australia. Western Malaysia is shown black, and other areas of tropical rain forest shaded.

Bengal cut off the tropical rain forest flora of Ceylon and South India; and then impinged upon a rain forest belt extending from Malaysia northwards to the region of the eastern Himalaya, but never so strongly as to break it down. From the dates of the stages of the eastward advance of dry conditions the three rain forest floras, (1) of Mascarenia, (2) of Ceylon and South India, (3) of Malaysia, with Burma, etc. remained isolated, and evolved independently. About the period when the extension of the dry conditions had become complete, it appears probable that the cold West-wind drift (vide map), which surrenders so little moisture

to the winds that blow upon Western Australia, reached the outer shores of Malaysia more distinctly than it does now, and rendered dry their face towards the Indian Ocean in a measure sufficient for an extension of certain dry-climate plants to Australia. During this extension, the rain forest flora would be at bay in the centre of the archipelago. But a recovery from this extreme soon coming, the rain forest flora spread back to the shores of the Indian Ocean, first reaching it where the west wind drift would be weakest, that is to say along the shores of Sumatra, and subsequently following the retreat of the cold current eastward into Java, and onward.

Within the Archipelago complicated orographic changes helped or hindered in various ways the recovery by the tropical rain forest of mastery; and it is for the present generation of naturalists to gather together the geographic and geologic details, which alone can lead to an understanding of the course of events. Much has been written, all of it subject still to criticism, and especially because most of the writers have neglected the possibility of climatic changes, in their effort to explain the peculiarities of the dispersal of living things by land changes: but this is certain, that at present what is here defined as Western Malaysia (see the map) holds the most intense rain forest flora of the old world—a flora which on that account must be considered to have had the least chequered history. It has produced in itself, in a greater measure than any other Old World flora, forests of lofty trees, with an abundance of epiphytes and a wealth of ground plants physiologically fitted to exist in deep and moist shade; and therefore has great claims on the attention of naturalists, because it demonstrates that there has been a nucleus of constant climate within the Malay Archipelago, though not by any means of necessity throughout it.

More than twenty years ago, Dr. O. Stapf called attention to the appearance that Borneo holds as it were a nucleus of the peculiar Malaysian flora. This would happen as a consequence of Borneo holding its least interrupted developments and is understandable upon the theory that the outer shores of the Archipelago were once dried by the greater volume of cold water in that northward branch of the west wind drift current which still affects southeastern Malaysia somewhat.

There are good reasons for thinking that the cold of the Glacial period did not alter the temperatures of the Equator, though greatly compressing the warm temperate and subtropical belts of the Globe. The seas of the Tropics fell, in consequence of the great volumes of water withdrawn and converted into ice caps at the poles, which ice caps again acting through gravity further lowered tropical sea-levels, a condition adding island to island in a region such as Malaysia where the seas are shallow.*

*The increase of land area in arctic and probably also in antarctic regions during the glacial period would, however, most probably have tended to a decrease of land area in the tropics, this effect counteracting that of the accumulation of ice at the poles (see C. E. P. Brooks, "*Evolution of Climate*", 1922)

These land unions may be considered as furthering the spread of the rain forest flora after the dry conditions of the outer coast had given way.

In the mountains of southern India and of Ceylon herbs occur of northern genera, and undoubtedly of northern origin. It is possible to believe that the Glacial period gave to most of those in southern India the opportunity which brought them where they are: but as regards those in Ceylon the view which is most acceptable is one which would allow them to have reached the peaks of that island as other plants have undoubtedly reached Oceanic islands, namely by the success now and then of a random shot. And the same supposition is at present the most tenable one for the explanation of the existence of a few truly northern genera (all herbs) upon the mountains of Malaysia. We believe then in a very long continuation of warm and moist conditions within the Malay Archipelago, unbroken over part of it, and that part central, but probably broken at one time on the periphery.

Holding that view, and finding it possible to put a part of it to a test in paying a short visit to some part of the Malay Peninsula we selected for our work the new hill-station of Fraser Hill in Lat. 3° 42′ N. Long. 101° 44′ E. We spent at it the second half of September, 1922, attempting to study the vegetation in the broadest way; and we collected all groups of plants. We were helped in this by Mr. G. S. Neal of the Forest Service, who, with two Malays, was sent most kindly by that Department to assist us. One of us (I.H.B.) has determined the collection of Seed-plants, the other (R.E.H.) has determined the ferns, and is responsible for the naming of the plants of lower position through specialists. We do not in this report enumerate anything below the mosses: but as Mr. H. N. Dixon has most kindly sent his determinations of them, they and their distribution are included. Mr. Ridley's Flora of the Malay Peninsula arrived in the Colony too late for use in the preparation of this report.

We selected Fraser Hill for our work because new roads and paths have made the forest particularly accessible, a new map has fixed the altitudes accurately, and not a little felling has brought the top of the forest within the possibility of investigation. It obviously promised more rapid results than any other place that was open to us.

Fraser Hill occupies the very summit of the Main Range on the Selangor-Pahang boundary. It is not virgin ground, which indeed was an advantage to us, for Mr. C. C. Curtis collected in the neighbourhood, and Mr. H. N. Ridley subsequently visited it twice: the Hon. Mr. C. Hose, Mrs. Ferguson-Davie and Mr. G. E. S. Cubitt also had collected a few plants there between 1919 and our visit; and Mrs. Smith of Bangkok collected ferns in June 1922. Mr. Ridley has described the new species which he got at Fraser Hill as from Sempang mines. These mines, existing as mines no longer, were under a hill whereon a Mr. Fraser built himself a

house, and the hill was called Bukit Fraser. When it was decided to develop a hill-station around this house, several other hill-tops being taken into the area, the name Bukit Fraser or Fraser's hill became no longer accurately descriptive: and we have followed the Ordnance Survey's map by calling it instead "Fraser Hill" as if an English township: by this name we mean all the land above 4,000 ft. which has been allotted for development as circumstances permit into a residential place.

The ridges may be described as three, called the North ridge, the South ridge and the Reservoir ridge, the second and the third being parts of the waterparting 4,289 and 4,370 ft. high respectively: the remaining one is entirely on the Pahang side of the division, and reaches 4,286 ft. while South summits on the same side of the waterparting reaches 4,360 ft. A line of vein-quartz extends under parts of the second and third, and while responsible for the resistance to aerial denudation which has made the two ridges, is also responsible for a change in the flora marked enough to carry peculiar species. There is vein-quartz elsewhere, but not so much in evidence, and under the upper end of North ridge appears a thin wall of quartzite.

About Fraser Hill the crests of the Main range are twisted out of the approximate north-and-south line of the range to be nearly east-and-west. That is how Fraser Hill possesses a "north ridge" entirely in Pahang. Westward from Reservoir ridge reaching 4,370 ft., with many serrations, the range attains 4,800 ft. in Pine-tree hill (so misnamed from the Dacrydiums upon it) and bending a little north successively there is the Gunong Semangkok of the maps (5,600 ft.) and the twin peaks of G. Ulu Liang (6,335 and 6,360 ft.) In the other direction the range falls to the Semangkok pass, where the Gap resthouse is situated at 2,790 ft., and rises very abruptly to a Trigonometrical station at 3,883 ft.,* (which appears to be the "G. Semangkok" of Mr. Ridley in his descriptions of plants) and with serrations to G. Ulu Semangkok (4,576 ft.), south of which is G. Ulu Kali (5,812 ft.), and then comes G. Mengkuang lebar, collected over by Mr. H. C. Robinson, the land falling to the Ginting Sempah pass.

We visited Pine-tree hill and a spot a couple of miles short of the Trigonometrical Survey's post on G. Ulu Semangkok.

The drainage from a large part of Fraser Hill runs down a valley toward Tras,—the Tras stream.—and from the immediate neighbourhood of Fraser's house this valley has been much mined for tin. We descended it to 3,300 ft.

It will be found quite clear in the following pages whether we collected the plants we name beyond the limits of Fraser Hill towards Pine-tree hill, or below the 4,000 ft. contour line either

*For some of the unpublished altitudes we record our best thanks to Mr. V. A. Lowinger, the Surveyor General.

towards the Gap or in the upper Tras valley or south-east of the Gap towards G. Ulu Semangkok: and we count no locality below 4,000 ft. as Fraser Hill.

The normal vegetation of Fraser Hill is forest and this we shall describe. A second form of vegetation is that which the steep hill sides, by reason of landslides, maintain: places in the sun being thus afforded to plants of small growth. Man by mining has destroyed the forest not a little, and into the bared places, the landslide vegetation is able to step; but in the wake of man follow many plants which would not seem to be part of the landslide flora: and the mining has been of long enough duration to have given them a good hold. The making of roads of course has exactly the same effect as the mining. These three elements, then, we distinguish on the face of the land,—the forest, on the one hand, and upon the other the landslide plants with the followers of man.

There have been periods in the history of the every part of the globe, when mountain-building was more active in it than now; and these would be periods of steeper slopes and numerous repeated landslides(yet the hill-sides of the Malay Peninsula are still very steep); and in such periods there would be a great opportunity for the development of species suited to such a peculiar condition. We are bound to believe that it has occurred; *Calanthe aurea, Rubus rosaefolius, Litsea citrata, Homalanthus populneus* are plants holding their places in the hills by landslides. *Pteridium aquilinum, Histiopteris incisa, Dipteris conjugata, Hypolepis tenuifolia* and probably the Gleichenias are ferns belonging to this group of plants.

The miners of Fraser Hill formerly had but narrow steep paths for their traffic: but now the station is reached by bullock carts and upon the roads one sees the process of introduction of weeds through bullock droppings: thus the droppings lying upon the bare roads carry grasses, notably *Eleusine indica* and in the second degree *Fimbristylis diphylla*. By their absence away from the droppings it is to be concluded that casual seeds of these upon bare landslide surfaces would have but a poor chance of survival.

The forest of the Main range in the Semangkok pass we consider changes at about 3,300 ft. There the Dipterocarps disappear and the depth of the vegetation is reduced from 200 ft. to 100 ft. Close to the elevation at which the Dipterocarps vanish, Arenga disappears, and Pandanus also. Upon the ridges above 4,000 ft. the big trees are about 100 ft. high. We roughly measured eighty-two on the North, South and Reservoir ridges, as given in the following table, taping the bole at breast height, but judging the other dimensions by eye with the help of a rod laid against the lower part of the bole. We measured all trees in the selected places that appeared to be upwards of five feet in girth, our malay assistants naming them: and we consider that we obtained the height of the forest in this way with a fair measure of accuracy. All measurements are expressed in feet.

TABLE I.

The Size of Trees at Fraser Hill.

Malay name and probable genus	No. of trees	limit of girth	limit of bole	limit of total height	limit of spread of longest branch
Kadondong (*Canarium*)	31	4.5-11.5	35-75	65-105	15-40
Nyatoh (*Payena*)	11	4.5-13	25-65	65-100	15-20
Mempuning (*Quercus*)	7	4.5-8	45-70	75-100	15-30
Kelat (*Eugenia*)	9	4.5-6.5	35-70	60-90	15-30
Rengas (*Gluta*)	5	5-10	40-60	80-100	15-25
Bintangor (*Calophyllum*)	2	5-6	65-70	85-90	20
Meragu	2	4-8	40-45	75-85	20-30
Medang (? *Phoebe*)	2	4.5-5	55-65	80-85	15-20
Penaga betul (*Calophyllum*)	1	8	55	85	30
Samok (*Eugenia*)	1	6.5	40	65	40
Ludai	1	6	20	85	20
Kadondong mata-hari (? *Trigonochlamys*)	1	5.5	25	70	20
Plangi	1	5.5	60	95	20
Kulim burong	1	5.5	60	85	25
Kayu kuning	1	5.5	60	80	20
Tampoi (? *Baccaurea*)	1	5	45	85	30
Kumala	1	4.5	60	90	35
Pelit	1	4.5	55	70	15
Pulangdaing	1	4.5	30	80	20
Kunkur	1	3.5	70	80	10
Putat (*Barringtonia*)	1	3.5	60	80	20

It is a very noteworthy fact that the big trees are upon the tops of the ridges: down their slopes, while there are more trees

to the acre than above, on the average they are smaller. Though not quite certain of the cause of this, we believe that it is a consequence of horizontal light passing under the crowns and making the conditions easier for the lesser growth, which so favoured in the air handicaps in the soil the competitors which might become of larger growth.

From the eighty to one-hundred feet high forest of Fraser Hill, if we ascend, as we do in the direction of Pine-tree hill, we get into forest fifty feet high, and then into forest twenty-feet high. Doubtless on G. Ulu Liang at the height of a further thousand feet, this reduction in depth would bring us to the real Elfin forest of our highest mountains: but we did not approach it at all. The vegetation of the summit of Pine-tree hill is of trees of Dacrydium Beccarii about twenty feet high, and of Rhododendrons and Vacciniums not taller.

Before passing on from the matter of the depth of the forest, it may be said that by means of Negretti and Zambra's dendrometer we measured some of the lofty trees at 3,300 ft. and below and found a lofty Shorea with a bole of 17 ft. in girth to reach 200 ft.

The tall forest, of course, holds more than one height of tree. On slopes it is not layered, but on the tops of the ridges the big trees with crowns 20-40 feet across (see the table above) shut out light enough to make it necessary for light-diffusion spaces to exist, whereunder a new layer of foliage can develop. The forest that is 50 feet high exhibits no layers.

About Fraser Hill there is no mossy forest; it is necessary to ascend higher for it. One of us spent a week in May, 1922, on G. Gedeh in Java at 4,500 feet, finding the climate there, height for height, colder and the forest more mossy. It is very probable that the air currents which sweep down the sides of G. Gedeh from anything up to 9,000 feet account for this; and there are no heights over Fraser Hill to supply cold down-draughts. The higher mountains further north were frequently observed to be covered with cloud when Fraser Hill was free from it (G. Ulu Liang is reputed to be very wet) and this more constant saturation of the atmosphere is no doubt necessary for the maintenance of mossy forest. However, the more one ascends from the height of Fraser Hill in the direction of Pine-tree hill, the more mossy becomes the forest and the deeper the layer of raw spongy humus upon it, until the latter is eighteen inches thick. In this mossy layer *Calanthe angustifolia, Burmannia longifolia, Sonerila rudis, S. velutina, Argostemma Yappii* find themselves particularly at home.

Pine-tree hill is about 4,800 feet high. It is evident that a flora of another type replaces the typical Fraser Hill forest there, and this one observation suggests that the type of vegetation which we have said commenced about 3,300 feet, gives way about 4,800

feet. The conclusion wants confirmation. In this replacing vegetation, because the trees are of lesser size than at lower levels, except for the interference of cloud, more sunlight is able to reach the ground. The vegetation which uses this sunlight is only in a small measure of phanerogamic herbs, apparently because of the acidity of the mossy raw humus on the surface of the soil.

There is no light-diffusion space in the mossy forest, and the small trees are very crowded. Upon the tops of the ridges of Fraser Hill there is however a somewhat imperfect light-diffusion space with the branches of the trees above it and with small to four feet high plants below it such as: *Polygala venenosa, Pterisanthes pulchra, Blastus cogniauxii, Sonerila rudis, S. albiflora, S. integrifolia, Phyllagathis hispida, Begonia tricornis, Begonia sp., Argostemma Yappii, A. urticaefolium, A. spinulosum, A. involucratum, Gardenia pulchella, Chasalia rostrata, C. lurida, Cephaelis* 2 spp., *Pentaphragma Scortechinii, Labisia pumila, L. longistyla, Ardisia Maingayi, Didymocarpus flavescens, D. hirta, D. malayana, D. platypus, D. quinquevulnera, D. crinita, D. venusta, D. pumila, Strobilanthes hirtisepalus, Filetia hirta, F. paniculata, Justicia subalternans, Gomphostemma* sp., *Piper stylosum, P. semangkoanum, C. brachystachys, Balanophora multibracteata, Burmannia iongifolia, Liparis* sp., *Calanthe angustifolia, Anoectochilus Reinwardtii, Anoectochilus* sp., *Cryptostylis arachnites, Globba aurantiaca, G. cernua, Camptandra ovata, Zingiber spectabile, Zingiber gracile, Zingiber Griffithii, Alpinia petiolata, Geostachys secunda, Curculigo latifolia, Tacca cristata, Pinanga polymorpha, Pinanga paradoxa, Licuala pusilla, Forrestia gracilis, Arisaema Scortechinii, Amorphophallus* sp., *A. Lowii, Lephatherum gracile, Lindsaya orliculata, L. decomposita, Trichomanes rigida, T. pluma, Diplazium bantamense, D. sylvaticum, D. tomentosum, D. fraxinifolium, Asplenium tenerum, Dryopteris crassifolia, D. calcarata, D. parasitica, Phegopteris laserpitiifolia, Taenitis blechnoides, Cheiropleuria bicuspis, Selaginella atroviridis, S. Wallichii.*

Equally under dense shade, but requiring running water, or an unusual amount of it, with good soil, are: *Impatiens oncidioides, Ophiorrhiza erubescens, Cyrtandra pilosa, Phaius callosus, Alocasia Beccarii* and *Schismatoglottis* sp.

This assemblage of small plants contains a very large percentage of seed-plants with a restricted distribution. Of the 70, 44 or 63 per cent, are confined to the Malay Peninsula and a further 13, making in all 57, or 84 per cent, do not pass out of what is here called western Malaysia. This is a greater percentage of endemism than in the overshadowing trees and shrubs, but not greater than among epiphytes, nor among giant herbs.

The overshadowing trees and shrubs number 105 and of them 60, or 57 per cent, are confined to the Malay Peninsula, and another 26, making in all 83, or 82 per cent, do not extend beyond western Malaysia.

The climbers which climb these forest trees are 28 in number, and of them 12, or 43 per cent, are endemic, while a further 10, or 22 in all, making 79 per cent, do not pass beyond western Malaysia. The figures will be found in Table II.

The wide-spread seed-plants of the forest-floor flora are: *Chasalia lurida, Chloranthus brachystachys, Crypstostylis arachnites, Panicum indicum* and *Lephatherum gracile*,—plants which do what no epiphyte does, namely spread from Ceylon to Malaysia, but with a broken distribution in almost every case.

The following are the Fraser Hill species which have an extension from western Malaysia into eastern Malaysia in varying degrees, without extending into Australia nor into the Pacific:

(forestal species)

Anoectochilus Reinwardtii reaches Amboina; *Memecylon myrsinoides* reaches Celebes; *Polygala venenosa, Xanthophyllum excelsum, Urophyllum glabrum, Quercus cyrtorrhyncha, Engelhardtia spicata, Dacrydium falciforme, Liparis compressa*, and *Eria major* reach the Philippines; and *Burmannia longifolia* reaches New Guinea;

(species of the open)

Joinvillea borneensis reaches Palawan only, and *Spathoglottis aurea* reaches Celebes. *Spathoglottis plicata* and *Gannia javanica* from western Malaysia reach Samoa and Fiji respectively.

The following species occur in Tenasserim or the Andamans and thence south and east into Malaysia but in no case through it to Australia, nor into the Pacific:

(forestal plants)

Limacia triandra, Leptonychia heteroclita, Schima Noronhae, Adinandra dumosa, Vitis mollissima, Arthrophyllum diversifolium, Rhodamnia trinervia, Elytranthe formosa, Eria floribunda, Curculigo latifolia, Tacca cristata and *Anadendron montanum.*

(plants of the open)

Elaeocarpus gambir, Daphne composita and *Glochidion coronatum.*

There are a few interesting plants with a distribution in the direction of Indo-China and China. They are (1) reaching Indochina *Illicium cambodianum, Labisia pumila*, and *Dacrydium elatum*: and (2) reaching China, *Gynura bicolor* and *Smilax laevis.*

The following have an extension of range northward to the eastern Himalaya: (all forestal, except *Jussieua, Pratia* and *Blumea*) *Jussieua fissendrocarpa, Randia racemosa, Ophiorrhiza erubescens, Blumea balsamifera, Pratia begonifolia, Ardisia colorata, Loranthus pentapetalus, L. coccineus, Elytranthe globosa, Conocephalus suaveolens, Ficus rostrata, Podocarpus neriifolius.* Out of these *Randia* extends to Australia, the *Podocarpus* to New Guinea; *Loranthus pentapetalus* and *Conocephalus suaveolens* to the Philippine Islands; the others not passing beyond western Malaysia in an eastward direction.

The following occur in Ceylon or Southern India and two reach the Seychelle islands:—

(forestal)

Melastoma malabathricum Eugenia zeylanica, Psychotria sarmentosa, Chasalia lurida, Vernonia arborea, Gaertnera Koenigii, Uncaria dasyoneura, Chloranthus brachystachys, Cryptostylis arachnites, Panicum indicum, Lophatherum gracile

(of open places)

Vitis trifolia, Pithecolobium angulatum, Drymaria cordata, Rubus rosaefolius, Trichosanthes bractescens, Embelia Ribes, Polygonum chinense, Litsea citrata, Homalanthus populneus (doubtful), *Trema orientalis.*

Of these two reach Australia, four eastern Malaysia, and the other two do not pass beyond western Malaysia.

Of the ferns nearly 50% reach Ceylon and nearly 20% reach the Mascarenes.

There remain 19 pantropic plants and everyone of them is a plant of the open. All of them are foreign to the flora of Fraser Hill, being intruders following man: and it will scarcely be necessary in this place to name them. Fourteen ferns are pantropical, six of these being plants of the open.

It is convenient to name here, before passing on, the few plants which we found above Fraser Hill and not at it: they are, *Polyalthia pulchra* which is endemic, an *Eugenia* which appears to be endemic, *Sonerila tenuifolia,* which occurs in Sumatra, Java and Borneo, *S. velutina, Webera salicina* and *Pentapterygium Scortchinii,* all three being endemic, *Diplycosia latifolia* which occurs in Sumatra, a *Diplycosia* and *Dischidia albida,* which are endemic, an *Antidesma* unmatched and possibly endemic, *Dacrydium Beccarii* which occurs in Borneo and in Mindoro, and lastly *Agrostophyllum bicuspidatum,* an orchid whose absence at Fraser Hill is improbable as it occurs from Tenasserim through the Peninsula to Java and to Celebes. Eight out of twelve are endemic species. Three of them are genuine xerophytes, *i.e. Dacrydium Beccarii* and the two species of *Diplycosia.*

The next statement gives the distribution, as known, of those species which are confined to western Malaysia, but not endemic in the Peninsula:—

reaching Lingga only, 1 species,
reaching Bancka only, 1 species,
reaching Sumatra only, 13 species,
reaching Borneo only, 11 species,
reaching Java only, 7 species,
reaching Java and Sumatra, 8 species,
reaching Borneo and Sumatra, 11 species,
reaching Borneo and Java, 5 species.
reaching Sumatra, Java and Borneo, 14 species;

this makes 46 as common to the Peninsula and Sumatra, 36 as common to the Peninsula and Borneo; and 34 common to the

Peninsula and Java: but it is certain that as Sumatra and Borneo become better known the number of plants common to either of them and to the Peninsula, will increase and greatly out-distance the number that are common to Java and the Peninsula.

TABLE II.

Distribution of Species.

	Confined within the Peninsula.	Extending to Islands of Western Malaysia.	Extending to the Pacific.	Extending to Tenasserim and the Pacific.	Extending to the Himalaya, China and the Pacific.	Extending to Ceylon or Mascarenia and the Pacific.	Without bounds in the tropics.	TOTAL.
Forest Plants.								
1. *Numbers of species*								
Shading trees and shrubs	60	26	6	5	4	4	..	105
Climbers	12	10	..	2	2	2	..	28
Overhead parasites	2	2	..	1	3	..	..	8
Epiphytes	36	17	1	2	..	..	..	56
Giant herbs	2	1	..	..	..	..	..	3
Plants of the forest floor	44	13	4	2	2	5	..	70
Ground ferns	2	4	4	..	7	12	3	32
Epiphytic ferns	3	4	14	..	5	17	5	48
2. *Percentages*								
Shading trees and shrubs	57	25	6	5	4	4	..	..
Climbers	43	36	..	7	7	7	..	..
Overhead parasites	25	25	..	13	37	..	..	..
Epiphytes	64	30	2	4	..	..	..	..
Giant herbs	67	33	..	..	..	..	..	..
Plants of the forest floor	63	18	6	3	3	7	..	..
Ground ferns	6	13	12	..	22	38	9	..
Epiphytic ferns	6	9	29	..	10	36	10	..
Plants of the Open.								
Trees and shrubs	2	3	..	3	1	3	..	12
Climbers	1	3	..	..	..	4	..	8
Herbs	1	..	4	2	4	1	19	31
Ferns	2	..	..	..	2	3	6	13

In the notes below some trouble has been taken to show how species montane in the north of the Peninsula descend more or less to sea level in the south. This we attribute to the distinct intercalation of a dry period in the north, and its disappearance, all but complete, southwards.

Of the plants which extend from the Peninsula into other parts of western Malaysia, without going further, two thirds descend to low levels. On the other hand very few of the Fraser Hill species which are endemic in the Peninsula descend to low levels. It is as if to have been able to pass between the Peninsula and other parts of western Malaysia, the forestal species with which we are dealing had to possess the ability to live in a climate as of Johore and Singapore at sea level.

A land connection between the Peninsula and Sumatra and another between the Peninsula and Borneo, in past ages, are admitted generally to have existed. It would seem right in general to believe that those land connections, at any rate on the last occasion of their existence, were low, having at the same time the climate of the south of the Peninsula; it is not necessary to place them as geologically remote, and it is possible to believe that while they (or the last of them if they were repeated) existed, our possibly already considerably evolved montane forestal flora retained its isolation in our mountains undisturbed, evolving locally its endemic species.

It is easiest to believe that the dry climate flora which seems to have passed down the coasts toward the Indian Ocean, did so earlier, and that the spread of these moisture loving plants into Java from Sumatra was subsequent.

Mention has been made of the occurrence of quartz in veins about Fraser Hill. This rock by its very slow decomposition makes the poorest of soils: and the vegetation on them is characteristic. In the first place *Dacrydium falciforme* is a most abundant tree. Its chief associates are Eugenias, one of which is *E. zeylanica*. Other trees which were found with it upon this soil are:—
Illicium cambodianum, a curious *Anonacea*, *Weinmannia Blumei* *Pygeum ovalifolium*, *Timonius* sp. *Lindera Wrayii*, *Elaeocarpus paniculatus*, *E. apiculatus*, *E. reticulatus*, *Vaccinium bancanum* *Rhodamnia uniflora*, *Cinnamomum aureofulvum* and *C. rhynchophyllum*, *Ecodia pachyphylla*, *Ilex* sp. *Melastoma malabathricum*, var. *perakense*, *Ardisia chrysophyllifolia* and *A. retinervia*, *Eugenia oreophila*, *Arthropanax pinnatum*, *Memecylon myrsinoides*, *Anorincleistus grandiflora*, *Wikstroemia Candolleana*, *Litsea* sp. *Rubus glomeratus*, *Vitis trifolia*, *Gynochthodes sublanceolata*, *Gaertnera Koenigii*, *Chasalia curviflora*, *Psychotria sarmentosa*, *Uncaria dasyoneura*, *Dioscorea laurifolia*, *Smilax laevis*, *Nepenthes sanguinea*, *Alyxia pumila*, *Pterisanthes pulchra*, *Scindapsus Scortechinii*, *Cyrtandromaea megaphylla*, *Argostemma Yappii*, *Didymocarpus hirta* *D. pumila*, *Pteridium aquilinum*, *Ceropteris calomelanos*, *Alsophila kingii*, *Hypolepis tenuifolia*, *Histiopteris incisa*.

Of the seed plants in this list 24 are endemic; 10 reach other parts of Western Malaysia: two pass just outside, one to Celebes the other to Mindoro; and the rest are much more widespread; *Melastoma malabathricum* reaching the Seychelles, *Engenia zeyanica*, *Uncaria dasyoneura*, *Psychotria sarmentosa*, *Chasalia lurida*, and *Gaertnera Koenigii* reaching Ceylon, *Vitis trifolia* reaching Himalaya, *Similax laevis* reaching China, and *Illicum cambodianum* reaching French Inlo-China.

The percentage of endemism is about 55 or not different from that found in the forest of Fraser Hill taken as a whole.

Summary. When a traveller ascends from the Semangkok pass to Fraser Hill, he passes at about 3300 feet out of a very lotfy forest into one of lesser growth—its tall trees being 80-100 feet high at Fraser Hill. At a little distance from Fraser Hill where the range runs higher, about say 4700 feet, another type of forest appears, being of lesser growth and more mossy. The forest which we have studied especially is a part of that between 3300 and 4700 feet, namely that at Fraser Hill itself between 4000 and 4370 feet. Of its woody shading plants 57% are confined to the Peninsula, of its epiphytes 64% and of its ground vegetation (seed plants) 63%. These are high percentages, and indicate a considerable isolation of the mountains of the Peninsula. The species of the forest which are not endemic exist for the most part as lowland plants in the south of the Peninsula: by doing which they suggest that when the Peninsula was joined by land to Sumatra or to Borneo the land bridge was in climate and want of elevation as Johore and Singapore. It is clear that the montane species did not cross it. These montane species were evolved locally from typically Malaysian genera, and do not declare themselves immigrants evolved elsewhere. All their genera except *Daphne*, *Geostachys*, and *Nenga* are known from Borneo and all except *Leptorrhyncha*, *Blastus*, *Anerincleistus*, *Phyllagathis*, *Filitia*, *Dacrydium*, *Agathis* (introduced however) *Camptandra*, *Geostachys* and *Joinvillea* are known from Java; whereas as many as 60 of the genera are absent from Ceylon.

We recognise as present another flora—the flora that requires open ground. It is small and of mixed origin, for there are in it species whose genesis would seem to be upon ground bared by landslides, and there are intruders following man. The flora is rather small for analysis though very interesting.

PART II.

Enumeration of the Seed-Plants, Ferns and Mosses Collected.

In this enumeration the literature cited is the last only which sums up in any way the distribution of the plants in various parts of Western Malaysia.

Abbreviations: G.=Gunong or mountain: P.=Pulau or island (s.n.)=specimen sine numero, an unnumbered specimen: and of Works quoted:—

King, Sir George, Materials for a Flora of the Malay Peninsula in the Journal of the Asiatic Society of Bengal vols. 48 to 75, continued by Mr. J. S. Gamble, with the assistance of Sir David Prain, Dr. O. Stapf, Mr. H. N. Ridley, M. C. deCandolle, Prof. J. M. Macfarlane, quoted as King, Mat., Prain, Mat., etc.

Ridley, H. N., Materials for a Flora of the Malay Peninsula Monocotyledons, Singapore, 1908, 3 vols. quoted as Ridley, Mat. Monoc.

Koorders, Excursions-flora von Java,3 vols. quoted as Koorders.

Smith, J. J., Orchideen von Java, Leiden 1905, quoted as Smith, J. J.

Merrill E. D., A bibliographic enumeration of Bornean plants in the Journal of the Straits branch of the Royal Asiatic Society, special no., 1921, quoted as Merrill.

Ames. O., in the last named, quoted as Ames.

WINTERACEAE.

Illicium cambodianum, Hance: King, Mat., 58, pt. 2, 374. A small tree distributed within the Peninsula and in Indo-China: within the Peninsula it is montane occurring on Kedah peak, on the Taiping hills, on G. Tahan, and down the tops of the Main range from the mountains of Telom to G. Mengkuang Lebar; on Benom; then on Mt. Ophir. It is common about Fraser Hill particularly upon vein-quartz ridges. The claret flowers smell of anise: they are produced both on the old wood and on the ends of branches and turn down. The stigmas overtop the anthers by a little and spread into a ring as the fruit forms. The Malays call the tree Bakau bukit or hill mangrove, because its red wood suggests mangrove wood.

MAGNOLIACEAE.

Talauma Candollei, Blume; Koorders, 2, p. 240: Merrill p. 251: *T. mutabilis*, Blume.. King, Mat., 58, pt. 2, p. 373. A shrub very variable in its different varieties, distributed from Sumatra and from Pungah in Lower Siam through the Peninsula to West Java and North Borneo. In the Peninsula it occurs on Kedah peak, in Penang and on the Main range from the mountains of Telom to the Semangkok pass. It was got coming into flower (8860).

Kadsura?. A big climber, flowerless, but appearing as if *Kadsura lanceolata*, King, was found at 3,300 ft. under Fraser Hill towards Tras. (7868). The Malays call it Akar belewar.

ANONACEAE.

Uvaria sp. A big liane with a stem 4 in. through, unfortunately without flowers and without fruit. (8804).

Polyalthia pulchra, King, Mat. 60, pt. 2, p. 55. A small tree, endemic within the Peninsula, and montane, distributed upon the Taiping hills and G. Bubu: upon the Main range from G. Kerbau to G. Mengkuang Lebar. It was obtained on Pine-tree hill at 4500 ft. (8533) in fruit. The fruit-stalks are coral-pink.

Goniothalamus macrophyllus, King, Mat. 60, pt. 2, p. 76. Koorders, 2, p. 252: Merrill, 260. A small shrub, little branched, distributed from Sumatra eastward to mid Java and north Borneo: in the Peninsula in the north montane, and is in Lankawi, and P. Adang, Penang, on the Taiping hills, and on the Main range of Perak, south to the Semangkok pass: further it occurs down approximately to sea level in Johore and Singapore. It was both in flower and fruit (8507, 8957): the wood is fragrant suggesting cinnamon. The Malays call it Tunging.

Goniothalamus sp. A small tree 30 ft. high found in flower (8896) and in fruit (7809), which matches none of the Peninsula species. The Malays call it Tampaian.

Anonacea. A tree of medium size, densely covered under the leaves with tawny felt, occurring upon the vein-quartz ridges (8684, 8930).

MENISPERMACEAE.

Limacia triandra, Miers: King, Mat. 58, pt. 2, p. 382. A climber, within the Peninsula, and extended northwards to Moulmein and French Indo-China: in the Peninsula montane, occuring in Lankawi, in Penang, on Kedah peak; and upon the Main range about Fraser Hill (8620) and on Bukit Kutu.

PITTOSPORACEAE.

Pittosporum sp. A bush with larger fruits than *P. ferrugineum*, Dryand. and not tawny under the leaves, but otherwise rather similar; as known at present quite local: it was obtained by Mr. Ridley at the Semangkok pass in 1904 (no. 12073) and now has been gathered at Fraser Hill (s. n.).

POLYGALACEAE.

Polygala venenosa, Juss.: King, Mat. 59, pt. 2 p. 130: Merrill, p. 324. A herb of the interior of Malaysia: in Sumatra, common in the forests of the Peninsula upon the mountains and to their feet sometimes, extended through Borneo to the Philippine islands. In the Peninsula recorded from Kedah peak, Penang, the Taiping hills, the Main range from G. Kerbau and the mountains of Telom to G. Tampin. It was found to be plentiful in the forest of Fraser Hill both in flower and with half ripe fruit (8590).

Xanthophyllum excelsum, Miq. Merrill p. 326: *X. affine,* Korth.: King, Mat. 59 pt. 2 p. 142: Koorders, 2 p. 453. A tree of the second rank in the forest, distributed from Tenasserim through western and north-eastern Malaysia extending from the Peninsula to Billiton and Java and through Borneo to the Philippines. It extends north to Tongkah in Lower Siam (lat. 8° N.), and southwards to Singapore both in the plains and on the hills. It was less common at Fraser Hill than *X. Maingayi.*

Xanthophyllum Maingayi, Hook. f.: King, Mat., 59 pt. 2. p. 136. An endemic small tree, distributed within the Peninsula, montane, on Penang, on the Taiping hills, and on the Main range from Perak to G. Tampin. About Fraser Hill it is numerically the commonest woody plant, being the universal under-tree of the hundred-feet high forest (8673). Like others of its genus the Malays call it Minyak berok, or baboon's oil.

CARYOPHYLLACEAE.

Drymaria cordata, Willd. Koorders, 2 p. 214. A weed which is to be considered as introduced through man into Malaysia, but from not-remote parts of Asia. It occurs in Sumatra through Java up to 6500 ft. In the Peninsula it occurs about Fraser Hill (7848) very sparingly, upon the roadside near to the Gap on the Semangkok pass, and at Ginting Sempah on the crest of the Kuala-Lumpur-Bentong road.

PORTULACACEAE.

Portulaca oleracea, Linn.: King, Mat., 60, pt. 2, p. 84: Koorders, 2, p. 208: Merrill, p. 247. A weed of all warm countries: in the Malay Peninsula scattered up and down. It was found at about 3300 ft. on the road from the Semangkok pass to Fraser Hill.

GUTTIFERAE.

Calophyllum spectabile, Willd. King. Mat., 59, pt. 2, p. 175: Koorders, Java, 2 p. 617. A *Calophyllum* apparently this, but without flowers and without fruit, was collected at Fraser Hill. *C. spectabile* is a wide-spread tree occurring from the Andamans and Nicobars and Cochin-china through Malaysia to Fiji and the Society Is.

TERNSTROEMIACEAE.

Ternstroemia Scortechinii, King, Mat., 59, pt. 2, p. 193. A medium-sized endemic tree. It is known to occur on the Taiping hills, and on the Main range from the mountains of Telom to Fraser Hill, and is on Benom. It is probable that it is also on G. Tahan. At Fraser Hill it was found attaining 30 ft. in height and in fruit (7754 bis).

Adinandra acuminata, Korth.: King, Mat., 59, pt. 2, p. 189. A tree of second rank occurring in Sumatra and the Malay Peninsula. In the Peninsula it is not uncommon from Penang and

Taiping to Singapore. In the south of the Peninsula it grows at sea-level: but it is one of those species which in the north scarcely descend so low. It has not before this been got on the Main range (8947) unless some of the material at Calcutta came thence.

Adinandra dumosa, Jack: King, Mat., 59, pt. 2, p. 188: Koorders, 2, p. 611: Merrill, p. 391. A small tree distributed through Malaysia. In the Peninsula it is frequent at low elevations: but has been got at 3000 ft. on Kedah peak and on Mt. Ophir (Ridley in Jour. F. M. S. Mus. 7, p. 39). It occurs in the Andamans and the Nicobars. At Fraser Hill it is common: but the Fraser Hill specimens all fail to dry black as *A. dumosa* normally does. It attains there 50 ft. in height (7760). Mr. Cubitt's no. 6527 from Fraser Hill is the same as ours.

Schima Noronhae, Reinw.: King, Mat., 59, pt. 2, p. 201: Koorders, 2, p. 610: Merrill, p. 390. A fairly large tree, distributed from Lower Burma, and Sumatra into the Malay Peninsula, to Java, Borneo and Palawan: in the Peninsula most frequent in the north, and not quite to sea level; reaching 5,000 ft. on G. Tahan and on the Taiping hills. At Fraser Hill it is common, and was in flower.

Gordonia sp. The yellowish flowers of a species of this genus were seen on the ground between Fraser Hill and Pine tree hill; but the tree whence they had fallen could not be identified.

Saurauia nudiflora, D. C.: King, Mat., 59, pt. 2, p. 198: Koorders, 2, p. 604. A small tree in distribution in Sumatra, through Java and in the Malay Peninsula on the Taiping hills, on G. Tahan and on the Main range of Perak and Selangor. It is favoured by the interference of man, and takes possession of cleared areas: below Fraser Hill it was plentiful on slopes that had been mined at 3000-4000 ft. (7764. 7873), attaining 20-25 ft. in height. It is called Jelatang Gajah, or Elephant nettle.

Saurauia rubens, Ridl. in Jour. Str. Br. Roy. As. Soc. 61, p. 1: A small endemic and very local tree producing its pendent flowers close to the base of the trunk in large groups. It carried flowers and fruit at Fraser Hill (8585): these fruits when ripe fall off their pedicels, which persist for a time. Curtis found it in flower in the same neighbourhood in May 1902, and Ridley in April 1911.

DIPTEROCARPACEAE.

Dipterocarpus cornutus, Dyer: King, Mat., 61, pt. 2, p. 93. A lofty tree occurring down the Peninsula from Kedah to Singapore: and ascending the Main range on the east side under Fraser hill to about 3300 ft. where it was in flower (s. n.).

Shorea bracteolata, Dyer: King, Mat., 61, pt. 2, p. 117. This lofty tree ascends to about 3300 ft. on the Selangor face of the hills under Fraser Hill. The species is distributed from Penang to Malacca and in Pahang, within the Peninsula, and is in Sumatra.

MALVACEAE.

Urena lobata, Linn.: King, Mat., 60, pt. 2, p. 43: Koorders, 2, p. 583: Merrill, p. 374. A pan-tropic weed. In the neighbourhood of Fraser Hill it follows man, as it is quite foreign to the forest which is the natural vegetation there: it is therefore most abundant where the land has been mined. Machado collected it near the Semangkok pass in 1903. Ridley in 1910 on Sakai clearings further north.

TILIACEAE.

Grewia fibrocarpa, Mast.: King, Mat., 60, pt. 2, p. 111. A tall bush, endemic, distributed generally in the lower ground of the Peninsula from Penang to Singapore, and upon the east side known from the islands of P. Tiuman and P. Tinggi. It occurs at Fraser Hill in forest and carried its scarlet fruits (8606), one only as a rule as the result of a whole panicle of flowers. The pulp is not unpleasantly acid.

Leptonychia heteroclita, Kurz: Merrill, p. 378: *L. glabra,* Turcz.: King, Mat., 60, pt. 2, p. 94. A shrub, in distribution from Tenasserim and the Andamans down the Malay Peninsula to the northern edge of Johore and in Sumatra, to Borneo and to Celebes. It was found on the edge of a gully at Fraser Hill (7870), and it has been collected before near Fraser Hill (Ridley 15586) and G. Kerbau and in the mountains of Telom.

Elaeocarpus gambir, Becc.: Merrill, p. 370: *E. stipularis*: King, Mat., 60, pt. 2, p. 133: Koorders, 2, p. 369. A tree of moderate size and quick growth, able to take advantage of the clearings of man. It is distributed through western Malaysia except eastern Java and is in Tenasserim. In the Peninsula it occurs under the mountains in the north as well as on them; and in the south it is down at sea-level. It was in flower and in fruit at Fraser Hill and had attained 40 ft. in height; it carried a sprinkling of red dying leaves (7794) on fruiting branches.

Elaeocarpus jackianus, Wall.: King, Mat., 60, pt. 2, p. 137. A small endemic tree which is able to take advantage of the clearings of man. In distribution it is general down the western side of the Peninsula: in Penang it occurs from the coast to the hill-tops at 2500 ft.: it is common at low elevations in Perak and down through Selangor and Malacca to Singapore. About Fraser Hill in places that have once been cleared, young plants of this are very conspicuous (7788), which by their cordate leaves may be distinguished varietally, as var. *cordata*, the leaves being 22 x 12 cm.: the berries sparingly pilose: their pedicels very hispid.

Elaeocarpus paniculatus, Wall.: King, Mat., 60, pt. 2, p. 129: Merrill, p. 371. A tree of the Malay Peninsula Banca and northern Borneo: it occurs in the lowlands of the Peninsula from Lankawi and Kuantan to Singapore: from the hills it has scarcely been recorded. At Fraser Hill it was found flowering sparingly (8567).

Elaeocarpus reticulatus, Ridl. in Jour. Str. Br. Roy. As. Soc. 61, p. 2. A bush about 6 ft. high carrying its berries upright; endemic and confined to the Main range from G. Kerbau to G. Mengkuang lebar. It was got at 7000 ft. on G. Kerbau, at 5000 ft. on G. Mengkuang lebar: at Fraser hill it occurs at 4200 ft. on vein-quartz (8897).

Elaeocarpus sp., near *E. apiculatus,* Mast. A small tree differing in small points from this species was collected at Fraser Hill in fruit. (8570). *E. apiculatus* is a tree of low elevations from Penang to Singapore down the west side of the Peninsula.

GERANIACEAE.

Impatiens oncidioides, Ridl., ex Hook. f. in Kew Bull. 1909, p. 11. A herb with beautiful yellow flowers found by water, endemic and montane, occurring along the higher ground of the Main range from G. Kerbau and Telom to G. Menuang Gasing at the head of the Langat valley in Selangor. It occurs at Fraser Hill with clear lemon-yellow flowers (8589) and more rarely with primrose yellow flowers (8943). It does not descend much below. The spur is in the mid-line of the flower.

RUTACEAE.

Evodia pachyphylla, King, Mat., 62, pt. 2, p. 210. An endemic shrub, montane and of very limited distribution in the Peninsula, occurring on the Main range from G. Kerbau, G. Bujong Malaka and Telom down to Fraser Hill where it was found on a vein-quartz ridge and also upon the very summit of Pine-tree hill at 4800 ft. which is west of Fraser Hill in the variety *grandis,* King. It was obtained in flower (8541). The flowers are of a cream colour.

BURSERACEAE.

Canarium rufum, A. W. Benn.: King, Mat., 62, pt. 2, p. 244. An endemic tree common at low elevations in Perak, extending thence southward to Malacca, and found also in the interior of Pahang. Fraser Hill (7831) at 4200 ft. is its uppermost limit as at present observed. It was sterile.

Trigonochlamys? A big tree growing at Fraser Hill, sterile (7802).

MELIACEAE.

Aglaia sp. A tree with hard wood and sparse foliage called by the Malays Tenkohalan, was collected in fruit (8680). It appears to be the species referred to in the Materials (Jour. As. Soc. Beng., 64, p. 65) by Sir George King with his collector's number 4606. The Sakais are said to eat the fruit.

CELASTRACEAE.

Salacia sp. near to *S. latifolia*, Wall. A sprawler found in mine area on the east of Fraser Hill at about 3600 ft., in flower (8600).

AMPELIDACEAE.

Vitis elegans, Kurz, King, Mat., 65, pt. 2, p. 392. A handsome vine endemic except that it extends to Banca, very plentiful about sea-level in the south of the Peninsula, but northwards rare: it has been collected in Malacca, and in Perak (probably Larut); also there exists a specimen carrying a Penang label, but not properly authenticated. It is very common at Fraser Hill (8445) and was both in flower and in fruit, its fruits small black berries.

Vitis furcata, Laws.: King, Mat., 65, pt. 2, p. 399. A rather small vine, in distribution in Sumatra and in the Malay Peninsula, by no means uncommon under the hills down the west side of the Peninsula from Penang to Singapore, in the Taiping hills and down the Main range from the mountains of Telom southwards. It was in flower and in fruit, (7787).

Vitis mollissima, Wall.: King, Mat., 65, pt. 2, p. 402. A common vine with large white berries exceedingly irritant to the throat (whence the Penang Malay name for it of Kesarkitan burong or bird's complaint) found from Burma, the Andamans and the Nicobars, and through the Malay Peninsula: in the Peninsula in the lowlands chiefly. It carried ripe fruit at Fraser Hill (s. n.).

Vitis trifolia, Linn.: King, Mat., 65, pt. 2, p. 688: *Cissus carnosa*, Gagnep.: Koorders, 2, p. 564: *Columella trifolia*, *Merr.*: Merrill, p. 368. A rather small vine, widely distributed from north-western India to southern China and through Malaysia to New Guinea. In the Peninsula it is not uncommon in the low country; but as regards the hills it has only been collected where roads have been made across the Main range, and its presence is artificial. It is not uncommon in cleared ground at Fraser Hill both with upwardly directed flowers and green fruits in September (8568).

Pterisanthes pulchra, Ridl. in Jour. Str. Br. Roy. As. Soc., 61, p. 2. A small woodland vine, endemic and absolutely local, very common, but very rarely flowering (8924). Mr. Ridley remarks on the difficulty of finding its flowers. He records it as on rocks but it is within our experience under trees that it is to be found; it was got upon vein-quartz and granite soils.

ILICACEAE.

Ilex sp. A bush attaining 10 ft. in height with black 5-celled fruit, growing on vein-quartz (8921).

Ilex sp. A small stiff tree which has been collected on Bukit Etam (Kelsall no. 1845). It was found at Fraser Hill in flower (8693).

ANACARDIACEAE.

Gluta ? A tree attaining 80 ft. in height rather like *G. elegans*, Kurz, but larger-leaved, which the Malays distinguish as Rengas gunong or mountain rengas (8678).

LEGUMINOSAE.

Millettia sericea, W. and A.: Prain, Mat., 66, pt. 2, p. 88: Koorders, 2, p. 382: Merrill, p. 303. A climber, distributed in western Malaysia:—Sumatra, the Malay Peninsula, north Borneo and through all Java, high and low. In the Peninsula it occurs through the low country on the west side from Penang to Singapore, owing some of its spread to the agency of man, and this is particularly the case about Fraser Hill where it occurs on old mined lands, and newly cleared house-sites (8662). The Fraser Hill plants are rather small-leaved, as are also some from Penang.

Desmodium heterophyllum, D. C.: Prain, Mat., 66, pt. 2, p. 135: Koorders, 2, p. 387: Merrill p. 304. A prostrate weed, spread from the Mascarene islands through southeastern Asia, from the wetter Himalaya, and the wetter parts of southern India and Ceylon, southern China, and Malaysia to the Philippines. In the Peninsula it seems not uncommon in the low country, but of its occurrence in the hills there is only evidence that it occurs on G. Kerbau. It was obtained, not abundantly, at about 3500 ft. in the mined lands under Fraser hill over Tras, (7874) whither obviously it has come with the help of man. It occurs in Java both on and under the mountains.

Desmodium laxum, D. C.: Prain, Mat., 66, pt. 2, p. 138: Merrill, p. 304. An upright herb, wide-spread from the eastern Himalaya and China to the Malay Peninsula and to north Borneo. It is uncommon in the Malay Peninsula, and on the Main range has been got only in Ulu Batang Padang and in Telom, and now within a hundred feet of the Gap at the Semangkok pass (8851) i. e. about 3000 ft.

Bauhinia cornifolia, Baker: Prain, King in Jour. As. Soc. Beng., 66, pt. 2, p. 186. A magnificent woody climber, visible by the mass of its flowers at half a mile away, endemic, and montane but closely allied to *B. bidentata,* Jack, with a wider distribution from Sumatra to the Philippines. In the Peninsula it occurs in Penang, on the Taiping hills, on the Main range from G. Bujong Malaka to G. Angsi in Negri-Sembilan, and just under the hills in Selangor; also on Benom in Pahang. It is common at Fraser Hill (8586).

Pithecolobium angulatum, Benth.: Prain, Mat., 66, pt. 2, p. 274: Koorders, 2, p. 356: Merrill, p. 292. A small tree, doubtfully distinct from the Javanese *P. montanum,* Benth., which is there a feature of certain montane forests: in distribution from the Eastern Himalaya through Burma and Siam to Sumatra,

Singapore, Borneo and the Philippines, also in the Andamans and the Nicobars. In the Peninsula it is on the hills of Penang, on the Main range at G. Batu Puteh, and in the south from Kuala Lumpur to Singapore at low levels. At Fraser Hill it appears to owe its place to man, and was found as a small tree not yet at flowering (8663). The Malays call it Petai belalang, or grasshoppers' Parkia.

ROSACEAE.

Pygeum ovalifolium, King, Mat., 66, pt. 2, p. 292. A small tree, endemic, and of a very restricted distribution, collected by Sir George King's collector at some unrecorded place in Perak, elevation 5000 ft., and now at Fraser Hill (8505, 8558). There is a gland at the base of the leaf below upon each side of the midrib. The Malays call it Sepuleh hutan, or jungle Fragraea.

Pygeum Maingayi, Hook. f.: King, Mat., 66, pt. 2, p. 288. A small shrub endemic and montane or submontane, found in upper Perak and down the Main range from Perak to G. Tampin, then in the forests of Malacca and upon G. Pulai in Johore. It was in flower and in fruit at Fraser Hill (7824, 8405). Though a shrub only at Fraser Hill in Negri Sembilan it seems to be a tree; or two species are confused.

Rubus glomeratus Blume: King, Mat., 66, pt. 2, p. 295: Koorders, 2, 324: Merrill, p. 288. A bramble, montane in the north of the Malay Peninsula, and in the south down near sea-level, in British North Borneo and through Java. In the Peninsula, in Penang it is above 1000 ft.; in the Taiping hills it is at and about 4000 ft.; it is at Fraser hill above 4000 ft., both in cleared places and in the direction of Pine-tree hill in a landslip area (8564): it was found also east of the Gap in Semangkok pass, and Machado collected it in 1903 somewhere near the Gap: it is known to occur on Bukit Kutu.

Rubus rosaefolius, Smith: King, Mat., 66, pt. 2, p. 296: Koorders, 2, p. 326: Merrill, p. 288. A small shrub with a pleasant fruit and for that reason encouraged by man throughout its distribution, which is from Kamaon in the north-western Himalaya to Japan, and southwards, in hilly regions, to Borneo and through Java. In the Malay Peninsula it occurs upon the very tops of the hills in Penang, on the Taiping hills from 4000 to 5000 ft., and down the Main range from Telom to Ginting Sempah just north-east of Kuala Lumpur. At Fraser Hill it is very common chiefly in the neighbourhood of the old mines.

SAXIFRAGACEAE.

Weinmannia Blumei, Planch.: King, Mat., 66, pt. 2, p. 299: Koorders, 2, p. 311: Merrill, p. 287. A medium-sized tree extending from Sumatra to (apparently) British North Borneo, and through Java. In the Peninsula it is found on the Taiping Hills

from 4500 to 5000 ft., on G. Tahan and on G. Bubu at 3300 ft., on the Main range about Fraser Hill (8653), on Benom and on Mt. Ophir. It is called Kasai bukit (hill Pongamia) by the Malays, and is by no means uncommon.

HAMAMELIDACEAE.

Bucklandia populnea, R. Br.: King, Mat., 66, pt. 2, p. 308. A tree of considerable size found from the Central Himalaya down in hilly regions to Sumatra and Java: in the Malay Peninsula, collected on G. Inas at 5000 ft. in Perak, and on the Main range in Ulu Batang Padang at 3900 ft., on G. Tahan, and on Benom. Under Fraser Hill (8855) it occurs commonly as an immature tree in mined lands from 3300 to 3700 ft. in the Upper Tras valley. As it reaches 6000 ft. in the Khasia hills, 3300 ft. is a relatively low elevation.

MYRTACEAE.

Tristania Maingayi, Duthie: King, Mat., 70, pt. 2, p. 72. An endemic tree but only uncertainly distinct from *T. merguensis*, Griff., which as its name implies occurs in Tenasserim (as well as in the Peninsula) and extends to Borneo. *T. Maingayi* is found on the hills of Penang and on Kedah peak and was obtained as an 80-feet-high tree at 4000 ft. in Fraser Hill (7752) with flowers.

Rhodamnia cinerea, Jack: Merrill, p. 423: *R. trinervia,* Blume: King, Mat., 70, pt. 2, p. 74: Koorders, 2, p. 673. A small tree distributed from Tenasserim southwards through western Malaysia (unless it fail in east Java), to the Philippines and to north Australia: in the Peninsula it is very common at low levels, but in the higher hills possibly is rare. At Fraser Hill it occurred as a small tree with leaves of less than the usual size, at 4,100 ft. (7832).

Rhodamnia uniflora, Burkill; *R. trinervia,* var., *uniflora* Ridl., in Jour. F.M.S. Mus., 4, p. 146: *R. trinervia,* Ridl. in Jour. F.M.S. Mus., 2, p. 114. A montane endemic tree, occurring on G. Tahan, and at Fraser Hill, where it is common upon ridges of vein-quartz (8656, 8941), and attains a height of 60 ft. The young leaves are yellow below, the fruit a dull purple. On the breadth of the leaves and upon their colour below the species is to be distinguished, and not as the name suggests upon the fewness of the flowers from the nodes, for some varieties of *R. cinerea* exist wherein the flowers may be very few. The G. Tahan specimens seen are Wray's and Robinbson's No. 5500 from between 5000 and 6000 ft., and Ridley's Nos. 16024 and 16272 from "Wray's camp." It is said also to be on Mt. Ophir, and G. Kerbau: but specimens have not been seen.

Eugenia corrugata, King, Mat., 70, pt. 2, p. 93. A small tree with dark foliage and hard wood, occurring at Fraser Hill

(8803), endemic within the Peninsula. The locality whence the type came in not exactly recorded but was probably on or under the Main range.

No. 7843 from Fraser Hill is an *Eugenia* which also may perhaps be this species.

Eugenia zeylanica, Wight: King, Mat., 70, pt. 2, p. 108: Merrill, 434. A tree of fifty feet with a rather small broken head, in distribution in southern India and Ceylon in the Andamans, in Sumatra, the Malay Peninsula and Borneo. In the Peninsula it occurs in Lower Siam at least from Takuapa, and southwards down both sides to Singapore. It was in flower at Fraser Hill (8677). The Fraser Hill specimens have smaller leaves than is usual at lower elevations.

Eugenia valdevenosa, Duthie: King, Mat. 70, pt. 2, p. 111. A small tree, endemic, occurring in Penang, the Taiping hills, and on the Main range from above Gopeng down into northern Negri Sembilan. It was obtained in fruit (7811, 8829), as a tree 25 ft. high.

Eugenia sp., apparently endemic, and an undescribed species. A tree occurring at Fraser Hill in flower (7751). It has curiously crested branches, which suggest, but differ considerably from, those of *E. setosa,* King.

Eugenia microcalyx, Duthie: King, Mat., 70, pt. 2, p. 124. A medium sized tree, endemic, distributed down the west coast of the Peninsula from Penang to Singapore and in the hills above Gopeng, in Ulu Bubong and about the Semangkok pass. It was in flower at Fraser Hill (7796).

Eugenia sp., near *E. valdevenosa,* Duthie; but with more coriaceous and smaller (12 x 6 cm.) leaves, was got on Pine-tree hill at 4,800 ft. (8535).

Eugenia oreophila, Ridl. in Jour. Str. Br. Roy. As. Soc., 61, p. 9. A shrub very closely allied to *E. jugalis,* Ridl., endemic and local, described from specimens collected in Ulu Semangkok by Mr. F. Dennys in 1907 as Kelat bukit or hill Eugenia; found by us in flower at Fraser Hill (8899) and at the Trigonometrical station immediately over the Gap upon the east side of the Semangkok pass (8870).

Eugenia n. sp., with obovate coriaceous leaves, 8 x 4 cm. the veins most obscure, was got in flower (8685) at 4,300 ft.

Eugenia sp., apparently near *E. corrugata,* King, with leaves about 14 x 7 cm. drying brown, and with flowers about 1.5 cm. across, was got in the valley of Fraser Hill (7777).

Eugenia sp. A tree with red bark, sterile, here and there about Fraser Hill (7806).

Barringtonia Scortechinii, King, Mat., 70, pt. 2, p. 138. A tree of second rank, endemic and montane or submontane except

that it has been collected at Temerloh in Pahang, found in Penang, in the Taiping hills and on G. Bubu, in the Main range from Fraser Hill (8691) to G. Berumban in Negri-Sembilan, reaching the foot of Bukit Kutu. It carried deep crimson flowers on the end of branches, hanging into the light-diffusion space of rather dense one-hundred-feet high forest.

MELASTOMACEAE.

Melastoma malabathricum, Linn.: King, Mat., 69, pt. 2, p. 6: Koorders, 2, p. 690. A shrub of wide distribution, occurring from the Seychelle islands, through the parts of India which are damp enough, into China, and through Malaysia to northern Australia and to New Caledonia. In the Peninsula it is general, and owes its abundance largely to man; but not its presence, for it can hold its own in light forest: and it reaches 5,000 ft. on G. Tahan. It is plentiful at Fraser Hill (8574) in the variety *perakense.*

Blastus Cogniauxii, Stapf: King, Mat., 69, pt. 2, p. 13: Merrill, p. 438. A weak shrub of shade with small inconspicuous flowers, distributed down the Malay Peninsula and in northern Borneo. In the Malay Peninsula it occurs in the Taiping Hills, in Upper Perak, on G. Tahan, on the Main range from Bujong Malaka and the Telom hills to Ginting Bidai east of Kuala Lumpur, on G. Taneng and G. Pantai in Johore, and again in low country about Kuala Lipis and in the south of Johore. It is frequent at Fraser Hill (8613).

Anerincleistus floribundus, King, Mat., 69, pt. 2, p. 17. A shrub 20 ft. high, endemic, and until found between Fraser Hill and the Gap, Semangkok pass, at about 3,300 ft., and west of Fraser hill on the track to Pine Tree hill at 4,300 ft. known only from the Taiping hills and on G. Bubu. Its terminal panicle of pink flowers with exposed yellow stamens is very conspicuous (8509).

Anerincleistus grandiflorus, Ridl. in Jour. Str. Br. Roy. As. Soc., 47, p. 45. A endemic and montane shrub, of limited distribution along the Main range from Fraser Hill to G. Mengkuang lebar. Curtis obtained it in the neighbourhood of the Semangkok pass at 2,000-3,000 ft. in May 1902: Mr. Ridley in flower in April 1911; the Hon'ble Mr. G. Hose collected it at Fraser Hill in flower in August 1919 and we found it at 4,200 ft. on one of the vein-quartz ridges of Fraser Hill (8939) flowering in September, 1922, but not freely. The specimens from the mountains further south are labelled 5,000 ft. and 5,400 ft. It carried flowers, with white petals and a pink calyx as well as ripe fruit.

Sonerila tenuifolia, Blume: Stapf and King, Mat., 69, pt. 2, p. 24: Koorders, 2, p. 692: Merrill, p. 442. A herb distributed through the wetter parts of western Malaysia, occurring in Sumatra, in western Java, in northern Borneo, and in the Malay Peninsula montane on G. Bubu, on G. Tahan, on the Main chain from G.

Kerbau and the mountains of Telom to Bukit Etam at altitudes of 4,000 to 5,300 ft., and on Mt. Ophir. It was not seen at Fraser Hill, but at Pine tree hill, at 4,800 ft., where it is common (8542).

Sonerila rudis, Stapf and King, Mat., 69, pt. 2, p. 27. A herb growing in moss in forests, endemic, and montane from 3,000 ft. upwards over a restricted area of the Main range, from G. Kerbau, G. Bujong Malaka and G. Batu Puteh south to the Semangkok pass; very common at Fraser Hill both in flower and in fruit (8414, 8624). It propagates itself by runners to a considerable extent.

Sonerila albiflora, Stapf and King, Mat., 69, pt. 2, p. 28. A herb of the forest floor, endemic, and montane, occurring on the main range at 3,500 ft. and above, from G. Bujong Malaka to the Semangkok pass, and also on G. Kledang over Ipoh at only 1,000 ft. above sea-level. It was found between Fraser Hill and Pine-tree hill (8508) in flower and with ripe fruit. The flowers are pale pink, as well as white. The Hon'ble Mr. G. Hose who collected it below Fraser hill in 1919, obtained it at 3,800 ft.

Sonerila integrifolia, Stapf and King, Mat., 69, pt. 2, p. 34. An upright herb of shade, endemic, and montane or submontane, found on the Taiping hills, and under them on the west side; on G. Bubu, on the Main range from Fraser Hill to Ginting Sempah north-east of Kuala Lumpur and under the Main range on the west side. It is very common at Fraser Hill (8540, 8602, 8641) both in flower and in fruit, and was got also above the Gap on the ascent towards G. Ulu Semangkok at 3000 ft. (8886).

Sonerila velutina, Ridl. in Jour. F. M. S. Mus., 4, p. 18. A herb, of a somewhat more upright habit and of a darker chestnut colour than the common *S. rudis*, endemic, and as far as known confined to the Main range between G. Kerbau, the mountains of Telom and the Semangkok pass occurring from 4500 ft. upwards. It was found at Pine-tree hill at 4800 ft. (8645), and on G. Ulu Semangkok which is south-east of the Semangkok pass.

Phyllagathis hispida, King Mat., 69, pt. 2, p. 46. A herb, endemic in the mountain-forests of the Peninsula, found on the Taiping hills, in upper Perak, on G. Tahan, and down the Main range from Ulu Batang Padang and the mountains of Telom to the Semangkok pass. It is very common at Fraser Hill and was in new flower (8623).

Marumia remorosa, Blume: King, Mat., 69, pt. 2, p. 47: Merrill in Jour. Str. Br. Roy. As. Soc. p. 444. A woody sprawler, about 20 ft. long, occurring in the interior of western Malaysia, i.e. in Sumatra the Malay Peninsula and in Borneo. In the Peninsula it is found in the low country from Penang and Trengganu southwards to the Johore straits; it ascends the Taiping hills to 3500 ft., on Fraser Hill to above 4000 ft. (7791, 8647) and Bukit Kutu. It was found in flower and with half ripe fruit and is frequent. The rose-magenta flowers fall in the afternoon.

Dissochaeta pallida, Blume: King, Mat., 69, pt. 2, p. 52. A endemic woody sprawler extending from Tomah in lower Siam (lat. 6° N.) down to Singapore, ascending the mountains as in Penang, in the Taiping hills to 4500 ft., and on the Main range to about 4000 ft. It carried flowers and fruits at Fraser Hill, (8553, 8646).

Dissochaeta annulata, Hook. f.: King, Mat., 69, pt. 2, p. 50: Merrill, p. 445. A woody sprawler, occurring down the Peninsula and in northern Borneo. In the north of the Peninsula it is montane occurring on Western Hill in Penang, on the Taiping hills, at Fraser Hill (8628) in the Main range, on Mt. Ophir, on G. Pantai in Johore, and lastly in Singapore island within 500 ft. of sea-level.

Anplectrum pallens, Blume: King, Mat., 69, pt. 2, p. 57: Merrill, p. 443. A sprawler, distributed in the interior of western Malaysia from Sumatra to northern Borneo: within the Peninsula occurring as a submontane or montane plant, in Penang on Western Hill, on the Taiping hills from 2000 ft. downwards, on the Main range from the Semangkok pass to the neighbourhood of Kuala Lumpur, and under this range as well as extending southwards to Singapore. It was not observed at Fraser Hill itself, but was obtained at the Trigonometrical station immediately over the Gap of Semangkok pass on the east side at 3800 ft. (8872), in fruit.

Medinilla venusta, King, Mat., 69, pt. 2, p. 61. A shrub, endemic and possibly confined to the Main range; but the origin of the specimens which Sir George King used when writing his description is not recorded more nearly than "Perak." It is common as an epiphyte at Fraser Hill, and is a very beautiful plant (8430, 8554).

Medinilla crassinervia, Blume: King, Mat., 69, pt. 2, p. 64: Merrill, p. 447. A beautiful bush with large cherry-red fruits, extending from the Malay Peninsula eastwards to Borneo and on to Ternate, Banda and New Guinea. Within the Peninsula it is montane in the north, but descends to low levels in Singapore and Johore: in the north it occurs in Penang, on G. Tahan, and on the Main range from Ulu Batang Padang to Gua Batu or Batu Caves near Kuala Lumpur. It was found under Fraser Hill in the upper Tras valley in a mined area upon the tops of boulders, at 3600 ft. (7866).

Medinilla Clarkei, King, Mat., 69, pt. 2, p. 63. A beautiful bush with white flowers and white berries, endemic and montane within the Peninsula, found on Gunong Tahan at 3300 ft., on the Main range from G. Kerbau to G. Menkuang lebar, on Benom and again on the top of Mt. Ophir. It is not uncommon at Fraser Hill (8557), where also the Hon'ble Mr. G. Hose obtained it in August 1919.

Medinilla heterantha, King, Mat., 69, pt. 2, p. 61. Specimens with seven equal anthers (s.n.), but otherwise appearing to

be *M. heterantha* were obtained just under Fraser Hill in the upper Tras valley at about 3500 ft. *M. heterantha* is an endemic and montane species of the Peninsula which is recorded as occurring on the Taiping hills, and on the Main range on G. Batu Puteh.

Memecylon dichotomum, C. B. Cl.: King, Mat., 69, pt. 2, p. 75. A small tree, endemic, submontane found on Kedah peak, on the Taiping hills, on G. Bubu, on G. Tahan, down the Main range in Perak and Selangor; and at Gemas on the Johore-Negri-Sembilan boundary. It occurs at Fraser Hill as a small tree about 30 ft. high under other trees (8697). It is called Nipis kulit or "thin-bark," like several other small trees.

Memecylon heteropleurum, Blume: King, Mat., 69, pt. 2, p. 78: Merrill, p. 453. A shrub with beautiful pinkish-blue flowers and purple fruits; which contain a pink-fleshed seed: distributed in the interior of western Malaysia, *i.e.* in Sumatra, in the Peninsula and in Borneo. In the Peninsula it occurs from Penang down the western side to Singapore. It occurred as an epiphyte at Fraser Hill (7869) and has been collected on G. Tahan. Our specimens have a venation in the leaf closer than usual, but not closer than *Curtis 814*, from Penang which is admitted as this.

Memecylon myrsinoides, Blume: King, Mat., 69, pt. 2, p. 81: Koorders, 2, p. 702: Merrill, p. 454. A shrub, distributed through western Malaysia, Sumatra, the Peninsula, Bancka, Java, Borneo and beyond in Celebes. In the Peninsula it is in the low country from Lankawi to Singapore: and the Fraser Hill locality is of a surprising elevation. It grew as a shrub 15 ft. high upon one of the vein-quartz ridges (8937) and was in flower. Is it really absent from western Java as Koorders implies?

Memecylon laevigatum, Blume: King, Mat., 69, pt. 2, p. 82: Merrill, p. 454. A shrub, in distribution from Tenasserim, the Andamans and Nicobars, through Sumatra, and the Peninsula to Bancka, Java and Borneo. In the Peninsula it is found in the lowlands down both sides. It was not found at Fraser Hill, but at the Trigonometrical station immediately over the Gap, Semangkok pass, on the east side at 3800 ft. (8888), in fruit; and in want of flowers the determination is slightly doubtful.

LYTHRACEAE.

Duabanga sonneratioides, Ham.: King, Mat., 67, pt. 2, p. 10. A tall tree distributed from the central Himalaya in hilly regions through Burma and Siam, to the Andamans and Nicobars, and to the Malay Peninsula, where it seems to reach its limit on the eastern slopes of the Main range not far from Kuala Lumpur. On the east side of Fraser Hill from about 3300 ft. (7867) downwards almost if not quite to the foot of the range it occurs in groups by streams: it is present also on the west side, but is rare. It exists in Penang, on the Taiping hills and is common in the

valley of the Perak river near Kuala Kangsar and again about the mountains of Telom at 4000 ft. The Malays who eat the acid young fruit call it berembang bukit.

ONAGRACEAE.

Jussieua fissendrocarpa, Haines, in Jour. As. Soc. Beng. N. S. 15. p. 313. A marsh-herb distributed from north-eastern India southwards at least to Singapore and possibly to the Philippines, and occurring down the Peninsula here and there in the lowlands. At Fraser Hill it was found in the vegetable garden under Fraser's bungalow (7850).

SAMYDACEAE.

Casearia esculenta, Roxb.: King, Mat., 67, pt. 2, p. 17. A shrub or small tree, distributed in southern India and Ceylon, and then from Tenasserim southwards to Sumatra and Singapore mostly in the low country, but also in the hills, as on Kedah peak, on the hills of Penang, and down the Main range from G. Kerbau and the mountains of Telom to G. Angsi. It is recorded as at 7300 ft. on Korinchi peak in Sumatra. It was found with rather small leaves in fruit on G. Ulu Semangkok, which is south-east of the Semangkok pass (8880).

CUCURBITACEAE.

Trichosanthes bracteata, Voigt: Koorders, 3, p. 297: Merrill, p. 584: *T. palmata*, Roxb.: King, Mat., 67, pt. 2, p. 29. A herbaceous climber distributed from the Himalaya to Ceylon and in Japan, as well as in China, thence southwards through Sumatra, the Peninsula, Borneo, Java, Celebes, Timor to northern Australia.: in the Peninsula not well collected and its presence is not attested for the south. At Fraser Hill it owes its abundance to the interference of man, and its stems extend over the exposed earth of the new roadsides, carrying globose green fruits in abundance (8562).

BEGONIACEAE.

Begonia tricornis, Ridl. in Jour. Str. Br. Roy. As. Soc., 75, p. 35. A herb of forest, endemic and montane, restricted to the Main range from the mountains of Telom to Ginting Bidai, east of Kuala Lumpur. At Fraser Hill it is not uncommon; it was found in fruit (8669) sparingly.

Begonia sp., not uncommon at Fraser Hill (8428) in flower growing in shade, half-prostrate and rooting at the nodes. The flowers are light pink, and the leaves are relatively broader than those of *B. tricornis*.

UMBELLIFERAE.

Eryngium foetidum, Linn.: King, Mat., 61, p. 71: Koorders, 2, p. 721. This American plant which is slowly spreading westward in Asia, is quite common at Fraser Hill round the old

mines, and down the valley towards Tras: so long as the forest is not allowed to close in, it will persist. Machado collected it near the Gap in 1903.

ARALIACEAE.

Heptapleurum, sp. A tree forty feet high, with dark claret flowers (8946), apparently a new species, found at 4000 ft.

Heptapleurum sp.A shrub 6 ft. high, with a prickly stem, is not uncommon at Fraser Hill (7882) and in the upper Tras valley (s.n.), allied to *H. ellipticum*, Seem., but differing in the inconspicuousness of the veins of the leaf.

Arthrophyllum diversifolium, Blume: King, Mat., 67, pt. 2, p. 59: Koorders, 2, p. 717: Merrill, p. 458. A small tree, distributed through western Malaysia and in the Andamans; in the Peninsula common all down the west side, whereas on the east side it has been collected only upon P. Tiuman; but it is assuredly present. It was found in forest at Fraser Hill (7834) at 4200 ft.,— an upward extension of its recorded altitudes, in flower.

Arthrophyllum montanum, Ridl. in Jour. F. M. S. Mus. 4, p. 24. A shrub, endemic, confined to the Main range from the mountains of Telom to the Semangkok pass. It was found on vein-quartz ridges at Fraser Hill in flower (8926), being three feet high only.

Arthrophyllum pinnatum, C. B. Clarke in part: King, Mat., 67, pt. 2, p. 59 in part. A small shrub, endemic apparently, occurring on the top of the hills in Penang, and on the Main range from G. Batu puteh to G. Mengkuang lebar. It was found on G. Ulu Semangkok at 3000 ft. (8865). The Mount Ophir plant differs.

CAPRIFOLIACEAE.

Viburnum sambucinum, Reinw.: King & Gamble, Mat., 72 pt. 2, p. 113: Koorders, 3, p. 285: Merrill, p. 512. A bush, spread through western Malaysia, in Sumatra, the Peninsula, Borneo and throughout Java, from about 1000 ft. to 5000 ft. In the Peninsula it is montane as regards the north, but descends to sea-level in Singapore: it occurs upon the summit of Government Hill, Penang, on the Taiping hills, and down the Main range from the mountains of Telom to G. Menkuang lebar. Often it owes its position to man in chief part, and this is the case at Fraser Hill, where it occurs about the old mines (7779). It was newly in flower.

Viburnum Beccarii, Gamble, Mat., 72, pt. 2, p. 114. A bush occurring in Sumatra and in the Malay Peninsula, montane. In the Peninsula it was first collected by Scortechini in Perak, probably in the mountains at some little distance to the north of Fraser Hill. It occurs at Fraser Hill (8631) and was in flower. It has been determined from descriptions only.

RUBIACEAE.

Uncaria dasyoneura, Korth.: King & Gamble, Mat., 72, pt. 2, p.136. A woody climber, distributed in Ceylon, and then disjointedly in Sumatra and the Malay Peninsula. In the Peninsula it is montane: it occurs in Penang, and is on the Main range in Perak where Sir George King's collector got it: at Fraser Hill it is very abundant and in Malacca, probably on Mt. Ophir. It is also said that Lobb got it in Singapore; but then Lobb's plants are not accurately labelled in all cases. At Fraser Hill where it goes to the tops of fairly large trees, it was in flower and new foliage and with enormous quantities of fruit (8409): it was also on G. Ulu Semangkok. Havilland distinguished the Ceylon plants varietally (Jour. Linn. Soc. Bot., 33, p. 82.)

Argostemma Yappii, King in King & Gamble, Mat., 72, pt. 2, p. 145. A half-epiphytic herb, endemic and of narrow distribution on the mountains, on G. Tahan above 5000 ft., and on the Main range from the mountains of Telom to G. Mengkuang lebar. It occurs at Fraser Hill (8573) at 4200 ft. and thence upwards to 4800 ft. in Pine tree hill (8527); and it occurs on G. Ulu Semangkok which is south-east of the Gap. It climbs the lowest one or two feet of tree trunks and has a very fleshy stem.

Argostemma urticaefolium, King: King & Gamble, Mat., 72, pt. 2, p. 146. A herb, perhaps occurring in Sumatra, and found upon the Main range of the Peninsula from the Telom mountains to Bukit Etam. It flowers about the Semangkok pass in May (Curtis 3748); and only in one spot were flowers found in September (8857).

Argostemma spinulosum, C. B. Clarke: King & Gamble, Mat., 72, pt. 2, p. 149. A herb, endemic, and montane, occurring on the Taiping hills, on the Main range from G. Batu puteh to Bukit Etam, and in Johore on G. Pantai. It is rare at Fraser Hill (8622).

Argostemma involucratum, Hemsl.: King & Gamble, Mat., 72, pt. 2, p. 151. An endemic herb with beautiful white flowers montane, occurring on the Taiping hills, on G. Tahan, on the Main range from G. Kerbau, Bujong Malaka and the Telom mountains to the neighbourhood of Kuala Lumpur, on Benom, and on Mt. Ophir. At Fraser Hill it is perhaps the commonest herb in the forest and in September its flowers, turned downwards obliquely with a conspicuous large green nectary, were everywhere (8412); but towards Pine-tree hill it disappeared.

Ophiorrhiza erubescens, Wall.: King & Gamble, Mat., 72, pt. 2, p. 172. A small forest herb, occurring in Upper Burma and down the Malay Peninsula as far as Bukit Sedanan in Malacca. It is montane or submontane, but has been collected at 6500 ft. on Ridley's G. Berumban. It was found in fruit at Fraser Hill (8594) and on G. Ulu Semangkok (8887).

Mussaenda mutabilis, Hook. f.: King and Gamble, Mat., 72, pt. 2, p. 182. A woody sprawler, endemic, rather submontane than montane, distributed from (perhaps) Penang and Bundi south-wards to Singapore, occurring on the Taiping hills, on the Main range and on Mt. Ophir to 2000 ft. at least. It was found under Fraser Hill at about 3800 ft., exposing its brilliant scarlet flowers at a height of about 20 ft. from the ground in a place where a fallen tree had let light into the forest (7759).

Mussaenda villosa, Wall.: King & Gamble, Mat., 72, pt. 2, p. 183. A woody sprawler, distributed in Sumatra and in the Peninsula southwards to Malacca and Mt. Ophir: it occurs at low elevations, and the Fraser Hill plant (s.n.) appears to be varietally distinct from the lowland plant. It was found just above 4000 ft. The Mt. Ophir plant also differs.

Lucinaea Ridleyi, King in King & Gamble, Mat., 72, pt. 2, p. 178: Merrill, p. 558. A woody sprawler occurring in the hilly parts of the north of the Malay Peninsula and in north Borneo. In the Peninsula it has been got in the Taiping hills, and on the Main range in the Batu Padang valley and at Fraser Hill at 4300 ft. in flower (8681). Lobb collected specimens which exist in herbaria with the label "Singapore" upon them; but Lobb's labels are not always accurate.

Urophyllum glabrum, Wall.: King & Gamble, Mat., 72, pt. 2, p. 198: Merrill, p. 539: *U. arboreum*, Korth.: Koorders, 3, p. 255. A small tree distributed in western Malaysia from Sumatra, through the Peninsula, in western Java, in Bancka, Borneo, and to the Philippines. It is one of the species which in the Peninsula occur at sea-level in the south; but are rare or absent in the lowlands in the north, however it is on P. Nipis, an islet off the Lower Siam coast near P. Adang,—but not in the usual form. It has been collected upon the Main range north of Fraser Hill; and is plentiful at Fraser Hill (8668, 8688) as a small tree 25 ft. high, in flower and in fruit. The Malays call it Tabosah.

Stylocoryna fragrans, Blume: King & Gamble, Mat., 72, pt. 2, p. 201: *Tarenna fragrans*, Merrill, p. 561. A shrub, distributed in Sumatra, down the Peninsula from Champawn in Lower Siam to Singapore upon both sides, and in Borneo. This is the first record of its occurrence in the higher hills. It was found at Fraser Hill at 4200 ft. (8686, 8882), and on G. Ulu Semangkok, in flower.

Webera salicina, Ridl. in Jour. F. M. S. Mus., 4, p. 34. A shrub, endemic and confined as far as is at present known, to the Main range from the mountains of Telom to Fraser Hill where it was got in the direction of Pine- tree hill (8513).

Randia racemosa, Cav.: Merrill, p. 563. *Randia densiflora*, Benth.: King & Gamble, Mat., 72, pt. 2, p. 208: *R. oppositifolia*, Koord.: Koorders, 3, p. 297: A shrub, widely distributed from north-eastern India and southern China down the hilly regions of

Burma, in the Andamans and Nicobars, through Malaysia to north Australia: in the Peninsula it is a wide-spread lowland plant of the west side to Malacca; but it has not been collected as yet on the east side north of P. Tinggi. Upon the Main range it is certainly on G. Haram and on Bukit Kutu. It was collected at Fraser Hill (8442) carrying its fragrant white flowers.

Randia anisophylla, Jack: King & Gamble, Mat., 72, pt. 2, p. 209. A small tree or large shrub, in Sumatra and distributed freely down the west coast of the Peninsula from Penang to Singapore, unless rare in Perak, but as yet quite unrecorded for the east coast. It is not uncommon at Fraser Hill attaining 30 ft. in forest under tall trees, in flower (8446), and in fruit (8660). The Malays call it Kayu laha.

Randia sp. A shrub unfortunately flowerless (8664), with two pairs of curved thorns at the base of each lower side branch for climbing, the lower pair of which two are brought against the parent axis by the angle at which the side branch stands,— a very perfect grapple arrangement.

Gardenia pulchella, Ridl. in Jour. F. M. S. Museums 4, p. 31. A fat stemmed small shrub with the flowers close to the ground, occurring in the mountains of Telom and it was found at Fraser Hill in immature fruit (8593).

Timonius diffusus, Ridl. in Jour. F. M. S. Mus. 4, p. 32. A small tree, endemic and montane, found on G. Tahan, and on the Main range in the mountains of Telom, where very common, and now at Fraser Hill (7801), in flower and in fruit, attaining 20 ft.

Timonius sp. near *T. montanus,* Ridl., a small tree found at Fraser Hill, with foliage 8 x 2 cm. and fruits 8 mm. long (8561). *T. montanus* occurs on G. Tahan.

Timonius n. sp. A small tree 10 feet high found on the vein-quartz ridges of Fraser Hill (8922 and s.n.) with a more or less fastigiate habit, carrying orange flowers, its leaves 8 x 3 cm., its ribbed fruits 12 mm. long.

Ixora Lobbii, Loudon: King & Gamble, Mat., 73, pt. 2, p. 78. A shrub, distributed through the Peninsula: it is very common in the lowlands from Khasum in Lower Siam (Lat. 8° 20′ N.) to Singapore; it is but little recorded from the hills, as Penang, the Taiping hills, the Main range at G. Batu Puteh and G. Pantai in Johore. At Fraser Hill it was observed sporadic in the forest carrying its reddish salmon flowers (8607).

Gynochthodes sublanceolata, Miq.: King & Gamble, Mat., 73, pt. 2, p. 92: Merrill, p. 580. A woody climber, distributed in the interior of western Malaysia, from Sumatra through the Malay Peninsula to north Borneo: in the Peninsula down the west side from Penang to Singapore, and now obtained from the Main range

at Fraser Hill, where it is plentiful (8571, 8936 and s.n.), both in flower and in fruit; it occurred on vein-quartz ridges.

Psychotria viridiflora, Reinw.: King and Gamble, Mat., 73, pt. 2, p. 15: Koorders 3, p. 266: Merrill, p. 575. A half-woody plant spread through the whole of western Malaysia, i.e., Sumatra, the Malay Peninsula, the whole of Java and Borneo: in the Peninsula from Koh Pennan and Trang in Lower Siam (Lat. 7° 30′ N.) southwards to Malacca, where it appears to be more common than elsewhere. It occurs at about 4000 ft. on the Taiping hills, and is in the mountains of Telom. It was got in fruit at Fraser Hill (8674), and ascends to 5000 ft. in Java.

Psychotria sarmentosa, Blume: King and Gamble, Mat., 73, pt. 2, p. 5: Koorders, 3, p. 265: Merrill, p. 573. A rather small woody climber, widely distributed, being in southern India and Ceylon, where it ascends to 4000 ft., in Burma, and in the Andamans, down the Peninsula, through Java and through Borneo. In Java it ascends to 6700 ft. It occurs at Fraser Hill on vein-quartz (8935). There is rather too much variability between the specimens put under this species for it to be considered as satisfactorily defined.

Chasalia rostrata, Miq.: King and Gamble, Mat., 72, pt. 2, p. 134: Koorders, 3, p. 268. A bush, distributed down the Peninsula not uncommonly from Larut to Singapore, and in west Java. It has been gathered before this on the lower slopes of the mountains of the Peninsula, *e.g.* the Main range in all three states, Perak, Selangor and the Negri-Sembilan, as well as on the lower slopes of Mt. Ophir but never before as high as Fraser Hill (7818, 8603). The Fraser Hill plants have hirsute pedicels.

Chasalia curida, Miq.: Merrill, p. 576: *C. curviflora,* Thwaites; King and Gamble, Mat., 72, pt. 2, p. 133: Koorders, 3, p 268. A weak shrub of wide distribution, and apparently breaking up into subspecies, found in Ceylon and southern India, in north-eastern India, and down through Burma into Sumatra and Malaysia to the Philippines: in the Peninsula it occurs everywhere through the lowlands: it ascends Kedah peak, the Taiping hills and the mountains of Telom, but no altitudes are recorded, except 3,000 ft. for Kedah peak. It was found here and there in the forest about Fraser Hill carrying flowers as well as its black fruits (8526, 8534, 8582), and ascended to Pine tree hill at 4,800 ft. It attains almost 5,000 ft. in Java.

Chasalia sp. This plant appears to be new and endemic within the Peninsula. It was collected near the Semangkok pass by Mr. Curtis in 1902, and by ourselves as a small tree 25 ft. high, with white flowers (8591).

Cephaelis sp., a one-stemmed woody plant, which is rather more slender than the next is common also at Fraser Hill (7810, 8627) where is grows in the forest in the same way. It also has been collected by Mr. Ridley (his No. 12073).

Cephaelis sp. A one-stemmed woody plant growing in shade and carrying its flowers horizontally, perhaps close to *C. Griffithii*, Hook f., is common at Fraser Hill (8435) where it was collected in 1911 by Mr. Ridley (his No. 15667), and occur also on G. Ulu Semangkok equally commonly.

Lasianthus rhinocerotis, Blume: King and Gamble, Mat., 72, pt. 2, p. 114: Koorders, 3, p. 271. A shrub, montane, occurring in Sumatra in the Malay Peninsula and on the mountains of west Java: in the Peninsula in the Taiping hills, on the Main range from the mountains of Telom and G. Batu puteh to Ginting Peras which is between the States of Selangor and Negri-Sembilan. It is not uncommon at Fraser Hill, in flower (8520, 8605).

Lasianthus longifolius, Wight: King and Gamble, Mat., 72, pt. 2, p. 116. A small tree with a most objectionable smell, endemic and submontane, on "G. Tunggal" in Perak, and on the Main range southwards from Fraser Hill, to Kuala Lumpur, and recorded for "Malacca" probably meaning Mt. Ophir. At Fraser Hill it attains 15 ft. in height and is by no means uncommon in flower and with purplish red fruit (8519) also it is on G. Ulu Semangkok (8875). It may be called Kahawa utan or jungle coffee by the Malays. Specimens collected under no (8604) at Fraser Hill may also represent the same species.

Lasianthus oblongus, King and Gamble, Mat., 72, pt. 2, p. 127. A shrub, endemic occurring on Kedah peak, on the Taiping hills, and on the Main range from Fraser Hill to the neighbourhood of Kuala Lumpur where it descends to low levels. It was found in the mine area of the upper Tras valley under Fraser Hill at about 3,500 ft. (7865).

Paederia verticillata, Blume: King and Gamble, Mat., 72, pt. 2, p. 97: Koorders, 3, p. 276: Merrill, p. 580. A woody climber, distributed in Malaysia, from the Peninsula through north Borneo to the Philippines and also in the mountains of west Java. In the Peninsula it occurs at low levels down the west side from Kedah to Singapore and on the east side is in Trengganu. This is its first record for the mountains of the Peninsula: it was found at about 3,600 ft. under Fraser Hill in the upper part of the valley of the Tras stream (7863) in fruit.

Spermacoce ocymoides, Burm., Hook. f., Fl. Brit. Ind., 3, p. 200: *Borreria ocimoides,* D.C.: Koorders, 3, p. 281. A small herb, a weed very wide through the Tropics, but not yet universal in the Malay Peninsula. It has reached the Gap, but has not ascended to Fraser Hill.

COMPOSITAE,

Adenostemma Lavenia, O. Kze.: Merrill, p. 587: *A. viscosum,* Forst.: King and Gamble, Mat, 74, pt. 2, p. 28: Koorders, 3, p. 316. A pantropic herbaceous weed, following man, not yet

abundant in the Malay Peninsula, but probably increasingly spreading. At Fraser Hill it occurs about the mines, and particularly in the old workings of the upper Tras valley (s.n.)

Ageratum conyzoides, Linn.: King and Gamble, Mat., 74, pt. 2, p. 29: Koorders, 3, p. 317: Merrill, p. 587. A pantropic herbaceous weed, very common in the Peninsula but except for a specimen from Bukit Kutu and another got in a Sakai clearing in Telom unrecorded for the hills. It occurs at Fraser Hill up to 4,100 ft.,

Erigeron linifolius, Willd.: King and Gamble, Mat., 74, pt. 2, p. 872: Koorders, 3, p. 322: Merrill, p. 587. A herbaceous weed, more or less pantropic, scattered through the Malay Peninsula, but hitherto there have been no records of its occurrence in the mountains. It occurs in the mined area both at Fraser Hill and in the upper Tras valley below, in flower and fruit (s.n.).

Vernonia arborea, Buch.-Ham.: King & Gamble, Mat., 74, pt. 2, p. 26; Koorders, 3, p. 314: Merrill, p. 586. A tree distributed in southern India and Ceylon where it ascends to 5000 ft., in north-eastern India, not including the Himalaya, thence southwards through Burma into Sumatra and down through western Malaysia, on to Celebes and in north-eastern Malaysia in the Philippines. It ascends to 6500 ft. in Java. In the Peninsula it occurs through the lowlands, and the only specimens which have been seen from its mountains are those from Fraser Hill (7846), and some collected by Mr. Ridley. It was seen as a tree 25 ft. high in fruit.

Blumea balsamifera, D. C.: King & Gamble, Mat., 74, pt. 2, p. 33: Koorders, 3, p. 324: Merrill, p. 587. A big almost woody herb, distributed from the central Himalaya down through the hilly parts of Burma to Malaysia, in Java, where it is more common in mid and east Java than in west Java; in the Peninsula it occurs throughout the lowlands except deep in the forests. It occurs at Fraser Hill up to 4100 ft. in some abundance.

Bidens pilosa, Linn.: King & Gamble in Mat., 74, pt. 2, p. 45: Koorders, 3, p. 339: Merrill, p. 589. A herbaceous weed pantropic, not uncommon through the Malay Peninsula in the lowlands and not absent from the hills though few have taken the trouble to record any observations on it. Mr. Ridley, however says of it, that it is found in Sakai clearings in the mountains of Telom. It was found under Fraser Hill in the mine area of the upper Tras valley at 3300 ft. (7880) in flower.

Erechtites valerianaefolia, D. C.: Koorders, 3, p. 342: Merrill, p. 589. A herb of American origin becoming pantropic; in the Peninsula as yet rare; but occurring in Sumatra, Java (which it reached in 1845 with coffee seed) Dutch Borneo. It is found at Fraser Hill (s.n.)

Gynura bicolor, D. C.: King & Gamble, Mat., 74, pt. 2, p. 40. A herbaceous weed occurring in southern China and down to Malaysia, where it occurs up and down the Peninsula: found plentifully about the mines at Fraser Hill (s.n.) in fruit.

Gynura sarmentosa, D. C.: King & Gamble, Mat., 74, pt. 2, p. 39: Koorders, 3, p. 344: Merrill, p. 590. A sprawling herb, distributed from Siam into Sumatra and western Malaysia generally and through to the Philippine islands and New Guinea: in Java it is more common in the western end than elsewhere. In the Peninsula it occurs in the plains southward to Singapore, and it has been recorded for the mountains thus,—the Taiping hills, and the Main range from the mountains of Telom to the old road from Kuala Lumpur into Pahang. It was found under Fraser Hill at 3300 ft. towards the Gap in flower and in fruit (7763) on a cleared hill side.

Emilia sonchifolia, D. C.: King & Gamble, Mat., 74, pt. 2, p. 38; Koorders, 3, p. 345: Merrill p. 590. A herbaceous pantropic weed, common through the Peninsula, and recorded as ascending high upon the Taiping hills. It was found but not abundantly at 4000 ft. at Fraser Hill, and under it in the mine area of the upper Tras valley (7826).

CAMPANULACEAE.

Pratia begoniifolia, Lindl.: Koorders, 3, p. 303. A small creeping herb distributed from the central Himalaya and southern China through Burma to Sumatra, the Malay Peninsula and Java: in the Peninsula it occurs in the Main range from G. Kerbau to G. Menuang gasing. At Fraser Hill it is quite common about clearings, and possibly owes its abundance there more to man than to landslides.

Pentaphragma Scortechinii, King & Gamble, Mat., 74, pt. 2, p. 53: An herb of forest, distributed through the Peninsula and reaching Lingga. In the north of the Peninsula it is generally upon hills, but it reaches sea-level in Singapore and southern Johore: it occurs in Penang, in the Taiping hills, at 3000-4000 ft., on G. Tahan, on the Main range from G. Kerbau and the mountains of Telom and G. Bujong Malaka into Negri-Sembilan on Bukit Sutu: it is also on the hills of the Dindings, on G. Keledang near Ipoh, and on G. Pulai in Johore. At Fraser Hill it is not uncommon and was in flower (8625).

VACCINIACEAE.

Agapetes Griffithii, C. B. Clarke: King & Gamble, Mat., 74, pt. 2, p. 59. A woody epiphyte with a swollen tap root, functioning as a store for water, endemic and montane, found on the Taiping hills, on the Main range at G. Batu Puteh and now at Fraser Hill, and old specimens are labelled "Malacca," which means Mt. Ophir.

At Fraser Hill it is common (7828). These Fraser Hill plants have the calyx slightly larger than the Taiping hills plants.

Agapetes micrantha, Ridl. ms in Herb. Singap. A shrub, endemic and very local in the Main range, having been collected first at Fraser Hill and now on Pine-tree hill (8537), but without flowers.

Pentapterygium Scortechinii, King & Gamble, Mat., 74, pt. 2, p. 60. A woody epiphyte endemic, and montane, occurring upon the the Main range from the mountains of Telom to Pine-tree hill where it was found at 4800 ft. in flower and in fruit (8548). King's collector gave its altitude as about 4500 ft. in Perak.

ERICACEAE.

Diplycosia latifolia, Blume: King & Gamble, Mat., 74, pt. 2, p. 71: Koorders, 3, p. 8: Merrill, p. 464. A small shrub, with an abnormal distribution as follows,—in Sumatra, in the Peninsula on G. Tahan, on the Main range in Perak and down to Bukit Etam, on Benom, in Borneo in Dutch Borneo and in Java upon Tosari near the eastern end of the island. It was found in fruit at Pine-tree hill (8532).

Diplycosia sp.: Merrill, p. 464: *Vaccinium microphyllum,* King & Gamble, Mat., 74, pt. 2, p. 62. A shrub, apparently endemic occurring on Kedah peak on the Taiping hills, on the Main range from G. Batu puteh to Bukit Etam, and on Mt. Ophir. At Fraser Hill it is very abundant (7895, 8942).

Rhododendron Wrayi, King & Gamble, Mat., 74, pt. 2, p. 75. A shrub, endemic and montane, found on G. Tahan, and on the Main range on G. Kerbau, in the mountains of Telom and southwards to G. Ulu Semangkok. It was found to be one of the most abundant of woody plants upon the top of Pine-tree hill, and was in fruit (8539).

Rhododendron jasminiflorum, Hook. f.: King & Gamble, Mat., 74, pt. 2, p. 88: Koorders, 3, p. 7: Merrill, p. 461. A shrub in distribution from Sumatra, in the Malay Peninsula and in Borneo: it is doubtful if it has occurred wild in Java. In the Peninsula it occurs on Kedah peak, on the Taiping hills, on G. Tahan, on the Main range in the mountains of Telom and down to Fraser Hill; and it occurs on Mt. Ophir. It was found in flower at Fraser Hill (8427).

Rhododendron malayanum, Jack: King & Gamble, Mat., 74, pt. 2, p. 78: Koorders, 3, p. 6: Merrill, p. 462. A shrub generally epiphytic, distributed through western Malaysia in Sumatra, the Peninsula, western Java and Borneo: in the Peninsula on the Taiping hills on G. Tahan, on the Main range from G. Kerbau to Bukit Etam and on Mt. Ophir. It is common about Fraser Hill, and was in flower and in fruit (7815, 8436); and

thence it continues to Pine-tree hill (8545). The statement that it occurs in Penang is an error as far as it is based upon the Singapore herbarium, where a specimen from Taiping hills has been mislabelled "Penang."

Vaccinium bancanum, Miq.: King & Gamble, Mat., 74, pt. 2, p. 64: J. J. Smith in Meded. Dept. Landbouw, 18, p. 159: Merrill, p. 465. A small tree found in the Malay Peninsula, in Bancka, in Borneo and Billiton and in a variety in Java. It occurs at Fraser Hill upon the vein-quartz ridges and was in flower (8928). In the Peninsula it grows on the Taiping hills, on the Main range about the Semangkok pass, and on Mt. Ophir.

MYRSINACEAE.

Maesa perakensis, Ridl. in Jour. F. M. S. Mus. 4, p. 45. A bush, endemic and montane, distributed in the Taiping hills and upon the Main range from the mountains of Telom to the Semangkok pass. At Fraser Hill and in the upper Tras valley below it, it is not at all uncommon and was in flower and in fruit (s.n.)

Embelia Ribes, Burm. f.: King & Gamble, Mat., 74, pt. 2, p 104: Koorders, 3, p. 30: Merrill, p. 476. A woody climber, of wide distribution, extending from the central Himalaya to Ceylon and from southern China down into Malaysia in Sumatra, the Peninsula west Java and northern Borneo. In the Peninsula it is through the low country; it ascends into the mountains of Telom, and was found in fruit at Fraser Hill (8619).

Labisia pumila, Benth. & Hook. f.: King & Gamble, Mat., 74, pt. 2, p. 115: Koorders, 3, p. 30: Merrill, p. 473. A half-woody herb, variable, and of rather general distribution in Indo-china and through Malaysia, from Sumatra, through the Peninsula, and Java, in Borneo and to the Philippines: it is in all parts of the Peninsula down to Singapore, and in the Dutch islands south of Singapore and in the Taiping hills and Main range is developed into the variety *alata.* It is very common at Fraser Hill, (8450), but at the season of our visit generally sterile.

Labisia longistyla, King & Gamble. Mat., 74, pt. 2, p. 117. A half-woody herb, endemic and montane, very restricted apparently on the Main range where it has been collected only on the section between G. Kerbau and the mountains of Telom and the Semangkok pass. At Fraser Hill it is much less common than *L. pumila,* but in ascending to Pine-tree hill it gradually increases in abundance (8538), until it has replaced the other. Its leaves are of a lighter green than those of *L. pumila,* and its fruits a trifle larger.

Ardisia retinervia, Ridl. in Jour. Linn: Soc. Bot. 38, p. 315. A shrub, endemic and montane, described upon specimens collected on G. Tahan above 5000 ft., and now its range is extended to Fraser Hill, where it is one of the species growing upon the vein-quartz ridges (7833).

Ardisia chrysophyllifolia, King & Gamble, Mat., 74, pt. 2, p. 123. A small shrubby plant, endemic and local, found on the Main range from G. Kerbau and Ridley's G. Berumban and G. Batu puteh to G. Ulu Semangkok. It is frequent at Fraser Hill, in flower (8528), as well as in fruit (8559), and was found on the south east side of the Gap upon G. Ulu Semangkok.

Ardisia colorata, Roxb.: King & Gamble, Mat., 74, pt. 2, p. 130: Koorders, 3, p. 28: Merrill, p. 470. A small tree of rather wide distribution,—from north-eastern India through Burma into Sumatra, the Peninsula and Borneo, and to mid Java: in the Peninsula it is general in the low country and upon the mountains normally at any rate to 2000 ft.: it ascends higher also— thus to the crest of the hills in Penang at 2500 ft., on the Taiping hills, and on the Main range on G. Kerbau, on Ridley's G. Berumban and elsewhere and at Fraser Hill it is abundant about 4000 ft. and attains 50 ft. in height. It is at the Padang Batu on Mt. Ophir. Our no. (8514) is the type and our no. (8698) is the variety *complanata.* The Malays call it Nielo utan.

Ardisia rosea, King & Gamble, Mat., 74, pt. 2, p. 150. A small shrub, endemic and montane, distributed on the Taiping hills, on G. Tahan and on the Main range from the mountains of Telom to the G. Ulu Semangkok, where we got it in flower (8891).

Ardisia Maingayi, King & Gamble, Mat., 74, pt. 2, p. 151. An undershrub, of 2-3 ft., endemic and apparently montane, occurring on G. Tahan, on the Main range from the mountains of Telom to G. Ulu Semangkok, and then on Mt. Ophir (Maingay's "Malacca" specimens doubtless being thence). We found it at Fraser Hill (8410), and on G. Ulu Semangkok (8874).

SAPOTACEAE.

Payena? A Sapotacea occurs on the ridge of Fraser Hill, possibly of this genus, a tree 100 ft. high (7766) of which no more than the foliage could be obtained.

EBENACEAE.

Diospyros Scortechinii, King & Gamble, Mat., 74, pt. 2, p. 212. A tree, endemic, montane except that it appears to occur low down in P. Tiuman off the east coast: in Penang, in the Taiping hills, and on G. Bubu, in the Main range from G. Bujong Malaka to Ginting Bidai east of Kuala Lumpur. It was collected in fruit on G. Ulu Semangkok (8883).

Maba perakensis, King & Gamble, Mat., 74, pt. 2, p. 205. A small tree, recorded only from Perak (no exact locality). At Fraser Hill about 30 ft. high, with blackish bark and small fruits (7855).

Maba sp. A small tree, resembling the preceding, apparently hitherto undescribed (7851).

STYRACEAE.

Symplocos ophirensis, C. B. Clarke: King & Gamble, Mat., 74, pt. 2, p. 246. A bush, endemic and montane, occurring on G. Bubu on the Main range from the Semangkok pass southwards to G. Mengkuang lebar between 3800 and 5000 ft., and on Mt. Ophir. We found it at the Trigonometrical station immediately south-east of the Gap of the Semangkok pass in fruit (8873). Its flowers have been obtained in December and May-June on Mt. Ophir; in January-February on G. Mengkuang lebar; and in August-September in the Semangkok pass.

Symplocos rubiginosa, Wall.: King & Gamble Mat., 74, pt. 2, p. 247: Merrill, p. 488. A tree, distributed in the interior of western Malaysia,—in Sumatra, in the Peninsula and in Borneo. In the Peninsula it occurs in the hilly districts in the north, but descends to the sea-level in the south. It was found in fruit at 4000 ft. (8597).

Symplocos sp. A species of this genus near *S. perakensis,* King & Gamble, was found about Fraser Hill (7780, 8614). It differs from *S. perakensis* in the calyx and in the presence of teeth along the leaf margin

OLEACEAE.

Jasminum Griffithii, C. B. Clarke: King & Gamble, Mat., 74, pt. 2, p. 257. A woody climber, endemic, occurring from Penang, down to Singapore upon the west side of the Peninsula, and now found in the Main range at Fraser Hill in fruit (7817).

Jasminum Scortechinii, King & Gamble, Mat., 74, pt. 2, p. 264. A woody climber endemic and montane, occurring on the crest of the hills in Penang, on the Taiping hills from 1500 to 4000 ft., and now recorded from Fraser Hill where it is plentiful, but it was not seen in the direction of Pine-tree hill, where the land rises above 4300 ft. It was in flower (8403), its flowers very fragrant, and also, but rarely, in fruit (8954).

APOCYNACEAE.

Alyxia pumila, Hook. f.: Gamble, Mat., 74, pt. 2, p. 420. A climber, thick leaved, endemic, occurring in the Main range from G. Bujong Malaka to the Semangkok pass and perhaps on Mt. Ophir, found in flower at Fraser Hill (8566, 8575), and at the Trigonometrical station immediately above the Gap on its south-east side (8871).

Alyxia Forbesii, King & Gamble: Gamble, Mat., 74, pt. 2, p. 420. A climber occurring in Sumatra and in the Malay Peninsula and in Java; montane, in Penang (formerly, but perhaps no longer) on the Taiping hills, on the Main range from the mountains of Telom to G. Mengkuang lebar, on Benom, and on G. Pulai in Johore. It was obtained at Fraser Hill at 4300 ft. (7839).

ASCLEPIADACEAE.

Dischidia astephana, Scortechini: Gamble, Mat., 74, pt. 2, p. 582. A herbaceous epiphyte, endemic, and montane, occurring in the Taiping hills from 3600 ft. upwards. on G. Tahan, on the main range from G. Bujong Malaka to Bukit Etam. on Benom, and lastly in Ulu Kuantan at a fairly low level. It occurs at Fraser Hill and forward to the summit of Pine-tree hill at 4800 ft. (8530) in flower and in fruit.

Dischidia albida, Griff.: Gamble, Mat., 74, pt. 2, p. 588. A herbaceous epiphyte, endemic, occurring on the Taiping hills, on G. Tahan, on the Main range from G. Batu puteh to the Semangkok pass, on Mt. Ophir and on G. Pulai. It was got near Pine- tree hill at 4600 ft. (8643) carrying its greenish white flowers.

Dischidia Scortechinii, Gamble, Mat., 74, pt. 2, p. 592. A herbaceous epiphyte, endemic and assuredly montane, but the locality whence the type came is unrecorded. We obtained it at Fraser Hill (8411) bearing its creamy white flowers.

Dischidia rosea, Ridl., in Jour. St. Br. Roy. As. Soc., 61, p. 31. A herbaceous epiphyte, endemic and local: the type came from the neighbourhood of Fraser Hill, where we found it carrying its pretty rose-pink flowers (8652).

LOGANIACEAE.

Fagraea oblonga, King & Gamble; King, Mat., 74, pt. 2, p. 612. A woody epiphyte, endemic and montane, distributed in the Taiping hills, and on the Main range from the mountains of Telom to the Semangkok pass. It was obtained at Fraser Hill in fruit (7861).

Fagraea sp. A shrub in half-ripe fruit, differing from the only specimen of *F. lanceolata* Blume, which we have seen, in having more mucronate leaves. *F. lanceolata* occurs in the Malay Peninsula only in Perak; and it is in Java. The Fraser Hill specimens bear the no. 7821.

Strychnos Scortechinii, A. W. Hill in Kew Bull. 1917, p. 168. A woody climber, endemic and montane, or submontane; it occurs under the west slope of the Taiping hills, and under the west slope of the Main range in Perak and Selangor as far south as Kuala Lumpur. We obtained it in the Valley at Fraser Hill (8675) carrying its grey-green fruits.

Gaertnera intermedia, Ridl. in Jour. F. M. S. Mus. VI, p. 163. A shrub, endemic and montane, quite local: the type came from the Semangkok pass, and we found it in flower and in fruit at Fraser Hill and forward to Pine-tree hill (7823, 8608, 8521, 8864 and s.n.) in flower and in fruit.

Gaertnera Koenigii, Wight: King, Mat., 74, pt. 2, p. 623; Koorders, 3, p. 276. A large shrub, with a broken distribution, in

Ceylon, where it is very common from sea-level up to 3000 ft., and in the Malay Peninsula on Kedah peak, on the Taiping hills, on the Main range from G. Kerbau and the mountains of Telom to G. Mengkuang lebar: it was obtained a century age in Singapore. C. B. Clarke, who of Malayan material had the Singapore specimen alone before him named it as a variety *oxyphylla* in Sir Joseph Hooker's Flora of British India 4, p. 91. Koorders states that its record for Java is an error. The flowers are very fragrant (8552, 8579).

BORAGINACEAE.

Tournefortia Wallichii, D. C.: King, Mat., 74, pt. 2, p. 280; A half-woody herb, occurring in the Nicobars, and in the Malay Peninsula from Lower Siam down to Singapore, in Sumatra and perhaps also in Java: found below Fraser Hill in the mined area of the upper Tras valley (7862), in flower.

CONVOLVULACEAE.

Lettsomia adpressa, Miq.: Prain, Mat., 74, pt. 2, p. 324. A woody climber, endemic, occurring in the lowlands of the Peninsula from Penang to Malacca; and found at the Gap in the Semangkok pass by the roadside as if a recent intruder, in flower (8884).

Lettsomia penangiana, Miq.: Prain, Mat., 74, pt. 2, p. 325. A woody climbing endemic, montane and submontane in the Peninsula, occurring in Penang to the crests of the hills, in the Taiping hills up to 4000 ft., and now found on the Main range at Fraser Hill up to 4000 ft. (7770, 8629). It carried its flowers and its magenta fruit, and occurred in cleared places.

SOLANACEAE.

Solanum nigrum, Linn.: Prain, Mat., 74, pt. 2, p. 329. Koorders, 3, p. 164. A herb, pantropic and extending into temperate countries all round the World. In the Peninsula scattered chiefly about the more cultivated regions. It is not yet recorded as present in Borneo. At Fraser Hill and in the mined area of the upper Tras valley it occurs plentifully, and was both in flower and in fruit.

Solanum verbascifolium, Linn.: Prain, Mat., 74. pt. 2, p. 329: Koorders, 3, p. 165: Merrill, p. 522. A half-woody herbaceous shrub, pantropic. In the Peninsula here and there throughout the more cultivated regions. At Fraser Hill a result of the interference of man, and plentiful in the old mines.

SCROPHULARIACEAE.

Scoparia dulcis, Linn.: Prain, Mat., 74. pt. 2, p. 362: Koorders, 3, p. 180: Merrill, p. 525. An American herb rapidly be-

coming pantropic: in the Peninsula not uncommon in the lowlands, where most settled. At Fraser Hill found by the old dam which is at 4100 ft.

GESNERACEAE.

Cyrtandra pilosa, Blume: Ridley, Mat., 74, pt. 2, p. 791. Kooders, 3, p. 200. A herb about 3 ft. high, occurring in Tenasserim, Sumatra the Malay Peninsula and in west Java. In the Peninsula found in Penang, on the Taiping hills, on the Main range from the neighbourhood of the Semangkok pass to Bukit Sutu in Negri-Sembilan, and on G. Pantai and G. Pulai in Johore. At Fraser Hill it occurs not as a shrub as described in the Flora of British India, but as a half-woody herb about 3 ft. high; and is found in gullies by water: it was in flower and with half ripe fruit (7890, 8615, 8950).

Agalmyla staminea, Blume: Ridley, Mat., 74, pt. 2, p. 738: Koorders, 3, p. 195. A beautiful epiphytic herb, distributed from Sumatra, into the Malay Peninsula and in west and mid Java. In the Peninsula it occurs from 1000 to 3500 ft. on the Taiping hills, and on the Main range it occurs from G. Kerbau, and G. Bujong Malaka to the Semangkok pass. Its elevation in Java is from 4300 to 5000 ft. At Fraser Hill it is common, but it was rarely in flower (8587).

Aeschynanthus perakensis, Ridl.: Ridley, Mat., 74, pt. 2, p. 734. An epiphyte and also on rocks, herbaceous, endemic, occurring on the Taiping hills and on the Main range from G. Kerbau and the mountains of Telom to the Semangkok pass. It was found by us at Fraser Hill (7888) and in the upper Tras valley at 3600 ft. (8859) in flower.

Aeschynanthus longicalyx, Ridl.: Ridley, Mat., 74, pt. 2, p. 735. A beautiful herbaceous epiphyte, endemic and confined to the Main range from G. Kerbau and the mountains of Telom to G. Mengkuang lebar. It occurs at Fraser Hill (Hose 46) and was found by us at Pine-tree hill (8531) in flower.

Aeschynanthus lobbiana, Hook.: Ridley, Mat., 74, pt. 2, p. 735: Koorders, 3, p. 194: *Trichosporum lobbianum*, O. Kze. Merrill p. 550. An epiphyte, herbaceous, distributed in the interior of western Malaysia, Sumatra, the Peninsula, and Borneo, and recorded as occurring in Java, but the record is not properly authenticated. In the Peninsula on G. Raya in Lankawi, on Kedah peak, on the Taiping hills: on the Main range from G. Kerbau to the neighbourhood of Kuala Lumpur, on Mt. Ophir, and on G. Pulai in Johore, also on the east coast from Kuantan and down to Singapore and at a low level at Ayer Panas in Malacca. It was in flower on Pine-tree hill (8549), its flowers very large.

Aeschynanthus sp. A common epiphyte about Fraser Hill found in flower (8418 and s.n.) and appearing to be a species new to the Peninsula.

Cyrtandromoea megaphylla, Hemsl.: Ridley, Mat., 74, pt. 2, p. 788. A rather coarse herb, endemic, found on Kedah peak, on the Taiping Hills, on the Main range from the mountains of Telom to Ginting Peras in Selangor. It was found, 4-5 ft. high at Fraser Hill on cleared ground at 4100 ft. (8560) carrying its large white flowers well under the leaves.

Didymocarpus flavescens, Ridl.: Ridley, Mat., 74, pt. 2, p. 749. A herb, endemic and local, occurring only about the Semangkok pass, and once collected under it near Kuala Kubu. It was both in bud and in fruit (8637).

Didymocarpus sp., intermediate between *D. flavescens* and *D. hirta*, with the leaves of the former and the large flowers of the latter was collected (8440).

Didymocarpus crinita, Ridl.: Ridley, Mat., 74, pt. 2,p. 748: A herb relatively tall among the Didymocarps, endemic and local, known only from the neighbourhood of the Semangkok pass. It was plentiful and in flower (8404, 8572, 8580, 8670) at Fraser Hill.

Didymocarpus malayana, Hook.: Ridley, Mat., 74, pt. 2, p. 752. A herb with beautiful yellow flowers, endemic, and apparently confined to the Main range, whereon it occurs from G. Kerbau and G. Bujong Malaka to Ginting Bidai. It occurs in some abundance about Fraser Hill and was in flower and rarely in fruit (8640).

Didymocarpus platypus, C. B. Clarke: Ridley, Mat., 74, pt. 2, p. 757: A white-flowered herb, distributed in Sumatra and the Malay Peninsula. In the Main range it occurs from G. Batu Puteh southwards to G. Angsi, descending the slopes to quite low levels, and in the south of the peninsula it reaches sea-level at Singapore. It was not easily found at Fraser Hill, but carried flowers (8949).

Didymocarpus quinquevulnera, Ridl.: Ridley, Mat., 74, pt. 2, p. 758. A rather untidy herb with a very pretty flower, endemic, occurring on G. Tahan, and upon the Main range from G. Kerbau to the neighbourhood of Kuala Lumpur where it descends to quite low levels. About Fraser Hill it was at the time of our visit the most evident of the Didymocarps upon the slopes of the ridges, generally with violet flowers, the throat white (8610), but sometimes with white flowers (8611).

Didymocarpus crinita, Ridl.: Ridley, Mat., 74, pt. 2, p. 748: Merrill, p. 527. A herb, montane and submontane in the Peninsula, extending to Borneo. In the Peninsula occurring on Kedah peak, on the Penang hills, on the Taiping hills, on the Main range from G. Kerbau and near Tapah to Bukit Tangga near Seremban and down the slopes on the west side almost to the base, at Temerloh in Pahang and on G. Pulai in Johore. At Fraser Hill it is common in the variety *Curtisii*, and carried deep violet flowers (8563, 8652).

Didymocarpus venusta, Ridl.: Ridley, Mat., 74, pt. 2, p. 760. A pretty white flowered herb, endemic and montane, restricted to the Main range from G. Bujong Malaka and the mountains of Telom to the Semangkok pass. It was just coming into flower at 4300 ft. (7894) in damp places at Fraser Hill.

Didymocarpus pumila, Ridl.: Ridley, Mat., 74, pt. 2 p. 763. A small herb, with a pretty deep violet flower, which is endemic and local. It was described from the Semangkok pass and occurs at Fraser Hill on one of the vein-quartz ridges (8657). It was in flower and in fruit.

ACANTHACEAE.

Thunbergia alata, Sims: C. B. Clarke, Mat., 74, pt. 2, p. 632: Koorders, 3, p. 213: Merrill, p. 538. An african herbaceous climber, which is gradually becoming pantropic: in the Peninsula as yet only in a few places. It occurs on the roadside near the Gap.

Staurogyne subglabra, C. B. Clarke, Mat., 74, pt 2, p. 640. A half woody herb, endemic, found on Kedah peak, on the Taiping hills and on the Main range from the mountains of Telom to the Semangkok pass. We found it in the valley at Fraser Hill in flower (7781).

Strobilanthes hirtisepalus, C. B. Clarke, Mat., 74, pt. 2, p. 656. A weak shrub, endemic, occurring on Kedah peak, on the Taiping hills and on the Main range in the mountains of Telom. We found what is believed to be it, flowerless, at Fraser Hill in forest (8616).

Filetia hirta, Ridl. in Jour. Str. Br. Roy. As. Soc. 61, p. 35. A creeping herb, endemic and local found only upon the Main range in the neighbourhood of the Semangkok pass. It is quite common at Fraser Hill with lemon yellow flowers (8408, 8576) or with salmon yellow flowers (8577). The Hon'ble Mr. G. Hose obtained it in flower in July, and Mr. Ridley in August.

Filetia paniculata, C. B. Clarke Mat., 74, pt. 2, p. 670. A tall herb, endemic, and of restricted distribution upon the Main range, having been collected by Scortechini at some unrecorded part of Perak, and by Ridley near the Semangkok pass. It was found by us 6 ft. high in forest at Fraser Hill (8601) with pale yellow flowers.

Justicia subalternans, C. B. Clarke, Mat., 74, pt. 2, p. 685. A herb, endemic and local, described from specimens collected about the foot of the Main range in Perak. The specimens from Fraser Hill diverge slightly, and therefore some doubt exists as to the determination of our specimens: they bear the number 8441. They carried pale yellow flowers and a few fruits.

VERBENACEAE.

Vitex gamosepala, Griff.: Gamble, Mat., 74, pt. 2, p. 855. Merrill, p. 514. A small tree occurring in Sumatra, the Malay

Peninsula and Borneo: in the Peninsula it is mostly submontane: it is found from Lower Siam (Tomoh) to Singapore down both sides of the Peninsula: how far it ascends the hills is not yet to be recorded. It was found at Fraser Hill upon the edge of forest; but would scarcely owe its presence in the station to the clearing by man (7793), in flower.

Clerodendron deflexum, Wall.: Gamble Mat., 74, pt. 2, p. 828. A small shrub, in distribution endemic, in the north of the Peninsula montane or submontane, but descending low in the south: it occurs on Kedah peak at 1500 and 3500 ft., on the Penang hills from 500 ft. upwards; on the Taiping hills, on G. Tahan on the Main range from the mountains of Telom to the neighbourhood of Kuala Lumpur, on Benom, in Malacca, Johore and Singapore as well as on the coast of Pahang. At Fraser Hill in flower (7819).

Clerodendron diversifolium, Blume: Gamble, Mat., 74, pt. 2, p. 829: Koorders, 3, p. 137: Merrill, p. 516. A shrub, distributed through western Malaysia, Sumatra, the Peninsula, Java, and Borneo. In the Peninsula throughout at low levels, and on the mountains, though little observed. It was found not uncommonly ascending to 4300 ft. at Fraser Hill, in flower (7782).

Clerodendron paniculatum, Linn.: Gamble, Mat., 74, pt. 2, p. 838. A tall herb extending from Siam through the low country of the Malay Peninsula to Singapore, found under Fraser Hill in the upper Tras valley at about 3300 ft. (8861).

LABIATAE.

Hyptis brevipes, Poit.: Prain, Mat., 74, pt. 2, p. 704: Koorders, 3, p. 153: Merrill, p. 520. A herb of American origin, now pantropic, found in the more thickly populated parts of the lowlands of the Peninsula, and occurring at 3300 ft. under Fraser Hill in the direction of the Gap by new buildings (7773) in fruit.

Gomphostemma sp. near *G. oblongum* Wall., but with a white corolla, was found at Fraser Hill in deep shade (8650).

PLANTAGINACEAE.

Plantago major, Linn.: Prain Mat., 74, pt. 2, p. 727: Koorders, 3, p. 231: Merrill, p. 543. A herb, common round the World in temperate countries, and invading the tropics with the help of man, persisting with a little encouragement about villages even in Singapore island. At Fraser Hill observed at 4100 ft. and under Fraser Hill in the mine area of the upper Tras valley.

AMARANTACEAE.

Amaranthus viridis, Linn.: Gamble, Mat., 75, p. 11: Koorders 2, p. 197: Merrill, p. 246. A pantropic herbaceous weed, frequent through the Malay Peninsula, and found under Fraser Hill at 3300 ft. in flower and fruit, by new buildings.

POLYGONACEAE.

Polygonum chinense, Linn., Gamble, Mat., 75, p. 22: Koorders, 2, p. 184: Merrill, p. 245. A herb occurring on the mountains of southern India and Ceylon; in the Himalaya and through China to Japan, southwards through Burma and Siam to Malaysia, where it occurs in Sumatra, the Peninsula, Borneo, Java, Timor, and the Philippines. It occurs throughout Java both high and low: in the Peninsula it is montane but descends cool mountain streams to the edge of the low country along the Main range from G. Kerbau and the mountains of Telom to the Semangkok pass. At Fraser Hill it is common near the old mines, and newer clearings, (8424), and about the old mines in the upper Tras valley.

NEPENTHACEAE.

Nepenthes sanguinea, Lindl.: Macfarlane, Mat., 75, p. 283: Merrill, p. 285. A half woody climber, occurring in the Peninsula and in Borneo: in the Peninsula found on the Taiping hills and G. Bubu, on G. Tahan, on the Main range from G. Bujong Malaka and the mountains of Telom to Bukit Etam, on Benom and on Mt. Ophir. At Fraser Hill it is by no means uncommon from below at 3500 ft. almost to the summit of Pine-tree hill at 4800 ft. It was in flower and in fruit at 4200 ft. (8630), but not balow (7878).

PIPERACEAE.

Piper stylosum, Miq.: C. de Candolle, Mat., 75, p. 302: Merrill, p. 209. A herb, extending through the interior of western Malaysia,—Sumatra, the Malay Peninsula and Borneo. In the Peninsula it is chiefly montane, occurring in the Taiping hills, on G. Tahan, on the Main range from G. Bujong Malaka, and the mountains of Telom to G. Tampin; and at low levels elsewhere particularly in Selangor, and Johore and on P. Tiuman. It is common at Fraser Hill (8439), carrying its white flowers.

Piper semangkoanum, C. de Candolle, Mat., 75, p. 304. A herb, endemic and restricted to the Taiping hills, and the neighbourhood of the Semangkok pass: however on G. Tahan there is a closely allied plant (Md. Haniff & Md. Nur. 8150). At Fraser Hill it occurs sporadic in the forest (8438, 8544), and carried white flowers as well as nearly ripe fruit.

MYRISTICACEAE.

Horsfieldia lemanniana, Warb.: Gamble, Mat., 75, p. 219. A tree, endemic, found chiefly in the lowlands of the west side of the Peninsula but recorded from the Taiping hills, and the lower slopes of the Main range in Perak. It was found at Fraser Hill as a small tree branching like a *Garcinia*, *i.e.* with long stiff side branches, and was in fruit (8679).

LAURACEAE.

Dehaasia? A rather tall tree in fruit with leaves 9 x 3.5 cm., which dry brown (7833), at Fraser Hill.

Cinnamomum rhynchophyllum, Miq.: Gamble, Mat., 75, p. 78. A small tree, occurring in Sumatra and locally in the Malay Peninsula, submontane as in Larut and at Tapah in Perak. This tree, up to 20 ft. high, is plentiful at Fraser Hill: it has been identified from descriptions. It smells strongly of camphor, and carried flowers and young fruit (7758, 8447, 8801).

Cinnamomum mollissimum, Hook. f.: Gamble Mat., 75, p. 82. A tree, endemic, occurring in Penang, on the Taiping hills, on G. Tahan and down the Main range from near Gopeng to Negri Sembilan. At Fraser Hill it occurred as a big tree, with remarkably fragrant bark and white wood (8700), sterile.

Cinnamomum aureofulvum, Gamble, Mat., 75, p. 84. A small tree, endemic and strictly local. It occurs at Fraser Hill on one of the vein-quartz ridges (8940), being sterile in September; it was collected in 1904 by Mr. Ridley on G. Ulu Semangkok; and a somewhat similar plant has been obtained on G. Ulu Kali, a mountain which is again a little further south.

Phoebe cuneata, Blume: Gamble Mat., 75, p. 109: Koorders, 2, p. 265. A tree occurring in the Malay Peninsula and in west Java; found in the Peninsula in the lowlands from Province Wellesley to Singapore, but montane also, as it has been obtained at 4100 ft. on the Taiping hills, and on the Main range at G. Batu puteh. Our Fraser Hill specimens were got with fruit at 4200 ft. (7807), and not altogether agreeing with the lowland plant may prove when the flower is collected to differ. The fruit is green and its pedicel red.

Litsea citrata, Blume: Gamble, Mat., 75, p. 146: Koorders, 2 p. 272: Merrill, p. 276. A small tree widely distributed from the Himalaya and southern China to Malaysia, where it is in Sumatra, the Peninsula, Borneo and Java. In the Peninsula it is montane occurring on the Taiping hills and on the Main range from the mountains of Telom to the Semangkok pass. On the Taiping hills it occurs at 3000 ft. About Fraser Hill it is common on cleared ground and was found in flower at 4000 ft. (s.n.); and it occurs about the old mines in the upper Tras valley. Its white flowers are fragrant. Its smooth green bark is characteristic. It appears suitable for sowing on elevated abandoned mine-areas.

Litsea penangiana, Hook. f: Gamble, Mat., 75, p. 154. A small tree, and montane, occurring in Sumatra and on the crest of the hills in Penang, on G. Bubu, and on the Main range from G. Batu puteh down to the neighbourhood of Kuala Lumpur where it descends to a low level. At Fraser Hill it is common and was in flower and with half ripe fruit (7804, 8448, 8699).

Litsea castanea, Hook. f.: Gamble, Mat., 75, p. 155. A bush or small tree, endemic, occurring in the low country from Larut through Selangor to Malacca; and now found at 4200 ft. at Fraser Hill (7884).

Litsea machilifolia, Gamble, Mat., 75, p. 171. A small tree, endemic, montane or submontane, occurring on the Penang hills at 1000 ft., on the Taiping hills down to the base, on the Main range from G. Batu Puteh to G. Tampin, and in the low country of Malacca and on to Singapore. At Fraser Hill it is common in the forest right to the tops of the hills at 4300 ft., carrying flowers and more commonly its large marble-like green fruits on swollen orange pedicels (7784, 8667, 8809).

Litsea sp. A tree of 60 ft. in height, with some affinity to *L. cordata,* Hook. f., the leaves measuring up to 18 x 9 cm., at Fraser Hill in fruit (7762).

Litsea sp. A small tree in flower and in fruit with leaves measuring up to 11 x 4 cm., at Fraser Hill (s.n.).

Litsea sp. A small tree with harsh leaves measuring up to 14 x 6 cm. in flower on a vein-quartz ridge (8931).

Lindera malaccensis, Hook. f.: Gamble, Mat., 75, p. 194: Merrill, p. 197. A small tree distributed from the Malay Peninsula to Borneo. In the Peninsula from the Larut plains to Singapore at low levels: and this is the first record of its occurrence at some elevation. It was got at 4200 ft. (8689).

Lindera Wrayii, Gamble, Mat., 75, p. 196. A bush, endemic, and in the Peninsula confined to the Taiping hills, and the Main range from the mountains of Telom to the Semangkok pass. We found it as a bush up to 10 ft. in height, both in flower and with fruit (8565, 8569, 8642), and again on G. Ulu Semangkok (8879).

Lindera caesia, Boerl.: Gamble, Mat., 75, p. 200: Merrill, p. 279. A small tree found in the Malay Peninsula, Borneo and Java. In the Peninsula it occurs on the Taiping hills, on G. Tahan, in the Main range near the Semangkok pass and south to G. Mengkuang lebar, its limits being as far as known 3000 and 5000 ft. It was found at Fraser Hill just inside the edge of a gully, in flower (7881) and again in fruit (7769).

Lindera? A tree (7837), found at 4200 ft. appears also to be another species of *Lindera.*

Lindera?. A tree 80 ft. high, and 60 ft. to the first branch was found at 4200 ft. with fruit going pink, which is thought to be a *Lindera* (7857).

CHLORANTHACEAE.

Chloranthus officinalis, Blume: Gamble, Mat., 75, p. 33: Koorders, 2, p. 40: Merrill, p. 209. A half-woody herb, distributed

from the eastern Himalaya and south-western China southwards through Burma the Andamans, and through Malaysia to the Philippines and New Guinea: in Java it occurs from 900 ft. to 6000 ft. In the Peninsula it is found in the lowlands in Penang and elsewhere, and is on the Main range. Below Fraser Hill it was found at 3500 ft. towards the Gap in fruit (7772).

Chloranthus brachystachys, Blume: Gamble, Mat., 75, p. 34: Koorders, 2, p. 41: Merrill, p. 209. A half-woody plant, rather more montane than *C. officinalis,* distributed from southern India and Ceylon and from Japan and the mountains of Assam, southwards through Burma to Malaysia where it occurs in Sumatra the Peninsula, Lingga, west and mid Java and north Borneo. In the Peninsula it is found in Penang, and on the Main range from the mountains of Telom and G. Bujong Malaka to the Semangkok pass. At Fraser Hill it is common and we found it also at the Trigonometrical Station immediately over the Gap on the south-east side (8889) carrying its yellow unripe and red ripe berries.

THYMELAEACEAE

Daphne composita, Gilg: Gamble, Mat., 75, p. 257: Koorders, 2, p. 657. A small shrub, found in Burma, Sumatra, the Malay Peninsula and Java. In the Peninsula it is montane, occurring in the Taiping hills, and the Main range from G. Bujong Malaka to Bukit Kutu. It was found at Fraser Hill (s.n.) in flower.

Wikstroemia candolleana, Meissn.: Gamble, Mat., 75, p. 259: *W. indica,* Mey. Koorders, 2, p. 656. A small shrub distributed in the Malay Peninsula, through Java and in Madura in an unusual way. In the Peninsula it occurs on Kedah peak, the Taiping hills, G. Tahan and G. Bubu (as a variety), the Main range from the mountains of Telom to G. Mengkuang lebar, and on Benom. At Fraser Hill it was found in flower (8932) on the poor soil of one of the vein-quartz ridges.

LORANTHACEAE.

Loranthus pentapetalus, Roxb.: Gamble, Mat., 75, p. 355: Koorders, 2, p. 158: Merrill, p. 259. A woody parasite, distributed from the eastern Himalaya through Burma and Siam to Sumatra, the Malay Peninsula, Borneo, Java and the Philippines. In the Peninsula it occurs at low levels; and the records for the mountains are few: it has, however, been collected on G. Batu puteh at 4000 ft. It was in flower at 4200 ft. at Fraser Hill (7813).

Loranthus coccineus, Jack: Gamble, Mat., 75, p. 356: Merrill, p. 236. A woody parasite, distributed from north-eastern India through Burma, in the Andaman islands, the Malay Peninsula, Banka and Borneo. In the Peninsula it is fairly general at low levels, and on the lower slopes of the mountains; but its

discovery at Fraser Hill adds greatly to the altitude at which it is known to occur. It was parasitic upon a *Maesa* and in flower (8648).

Loranthus Lobbii, Hook. f.: Gamble, Mat., 75, p. 358. A woody parasite, endemic and not uncommon in the Peninsula at low levels and up to 4000 ft. It has been collected from Kedah peak, Penang, the Taiping hills, on G. Tahan, the Main chain from Perak to G. Mengkuang lebar. It has been said to occur also in Borneo, but apparently in error. It was obtained at Fraser Hill in flower (8687).

Elytranthe formosa, Don: Gamble, Mat., 75, p. 372: Koorders, 2, p. 164. A woody parasite, distributed from Tenasserim, south through the Peninsula, and to west Java. In the Peninsula it is montane and restricted to the Main range from G. Bujong Malaka and G. Batu puteh to G. Mengkuang lebar, and also it has been obtained at Temerloh in Pahang. At Fraser Hill it was upon an undetermined tree at 4200 ft. (8925) coming into flower, and also at Pine-tree hill.

Elytranthe globosa, G. Don: Gamble, Mat., 75, p. 377: Koorders, 2, p. 164. A woody parasite on various trees, distributed from the central Himalaya through Burma, to the Malay Peninsula and to Java. In the Peninsula it is a lowland plant from the north down to Singapore, and this is its first record for the mountains. It was found at Fraser Hill (s.n.) at 4200 ft.

Lepeostegeres Kingii, Gamble, Mat., 75, p. 382. A woody parasite occurring in the Malay Peninsula and Borneo: in the north of the Peninsula montane, in the south descending to sea-level: the mountains upon which it occurs are Kedah peak, the Taiping hills, G. Tahan, the Main range from Ulu Batang Padang to Fraser Hill, Bukit Sedanan in Malacca which just attains 1000 ft., and then in southern Johore it is down near the coast. At Fraser Hill we found it exceedingly common, its very large flowers littering the paths, tattered by birds hunting honey (8692).

SANTALACEAE,

Henslowia buxifolia, Blume: Gamble, Mat., 75, p. 274: Merrill, p. 241. A woody parasite found in the Peninsula, Bancka and Borneo: in the Peninsula at low elevations from Perlis and Penang to Singapore and on the mountains of Kedah peak, the Main range at Fraser Hill, Benom and Mt. Ophir. We found it in flower (7812) at 4300 ft.

Henslowia sp. A woody climber with leaves broadly elliptic, 5.5 x 3.5 cm., of the affinity of *H. Ridleyi*, Gamble, but not it, was got on a vein-quartz ridge at Fraser Hill (8923).

BALANOPHORACEAE.

Balanophora multibracteata, Fawcett: Gamble, Mat., 75, p. 397. A herbaceous parasite occurring in Sumatra and in the Malay Peninsula. In the Peninsula occurring in the Taiping hills and in the Main range from the mountains of Telom to the Semangkok pass. At Fraser Hill it is frequent and was newly in flower: it was traced to the roots of a big woody climber thought to be a Rubiacea (7786).

EUPHORBIACEAE.

Glochidion sericeum, Hook. f., Fl. Brit. Ind. V. p. 326. Koorders, 2, p. 473: Merrill, p. 329. A shrub, distributed in Sumatra, down the Malay Peninsula, in Bancka, western Java and Borneo: in the Peninsula it is a lowland plant from Perak and Penang to Singapore on both sides of the Peninsula, and ascending the mountains to some extent. At Fraser Hill it was found on a clearing at 4200 ft. (8944). This is higher than its record for Java of 3700 ft.

Glochidion coronatum, Hook. f., Fl. Brit. Ind. V. p. 326. A shrub occurring in Tenasserim and southwards to Singapore mostly at low elevations but collected along the Main range. At Fraser Hill it carried its pink fruits (8854).

Breynia coronata, Hook. f., Fl. Brit. Ind. V. p. 330. A small tree, endemic, found in Perak first at Ulu Bubong and now got at Fraser Hill in a clearing (7775).

Baccaurea bracteata, Muell.-Arg.: Hook. f., Fl. Brit. Ind. V, p. 372: Merrill, p. 330. A tree distributed in western Malaysia from Sumatra into the Malay Peninsula and to Borneo: in the Peninsula at low elevations in Perak, Pahang and Negri Sembilan: found flowerless at Fraser Hill (7883) and the identification consequently doubtful. The Malays called it Taban burong or bird's gutta-percha.

Antidesma velutinosum, Bl.: Hook. Fl. Brit. Ind. 5, p. 356. A large bush with claret fruits found between Fraser Hill and Pine-tree hill (8515) and again with flowers on G. Ulu Semangkok (8878).

Antidesma fallax, Muell.-Arg.; Hook. f., Fl. Brit. Ind. V, p. 359. A shrub 20 ft. high, endemic, occurring freely at low elevations, submontanely from Lower Siam (Kantang) to Singapore, and ascending the mountains, at any rate the Main range, whereon it has been got on G. Mengkuang lebar at 5000 ft. It occurs at Fraser Hill as a bush up to 4200 ft. (8655).

Macaranga Hullettii, King: Hook. f., Fl. Brit. Ind. V. p. 452: A very quick-growing tree, endemic, occurring down the west side of the Peninsula in swamps and swampy forest, from Perak to Malacca, and now found to be common on Fraser Hill in forest

at 4000 to 4300 ft. (8518); and what is most interesting, it regenerates itself in the one hundred feet high forest. These Fraser Hill specimens have unusually large leaves.

Macaranga puncticulata, Gage. A tree at Fraser Hill up to 50 ft. in height and on Pine-tree hill up to 15 ft. in height, is common in the forest where it is able to regenerate and was in fruit (8522, 8658).

Homalanthus populneus, Pax: Koorders, 2, 506: Merrill, p. 347. *Homalanthus populifolius,* Grah.: Hook. f., Fl. Brit. Ind. V, p. 469. A shrub, distributed from Ceylon (possibly wrong) in Sumatra, the Malay Peninsula, Java, Borneo, Celebes, the Philippines and to north Australia: in the Peninsula occurring in the lowlands from Penang to Selangor, and in Pahang including P. Tiuman. It is in the mountains of Telom: and is common at Fraser Hill, as well as in cleared mine land below it.

ULMACEAE.

Trema orientalis, Blume: Hook. f., Fl. Brit. Ind. 5, p. 484; Koorders, 2, p. 77: Merrill, p. 217. A small tree, widely distributed from India both north and south and from China to Sumatra, the Malay Peninsula, Java, Borneo, and other islands of Malaysia and to Australia and the Pacific, quick to take advantage of the clearings of man, and in the Peninsula wide. At Fraser Hill it occurred near the houses, both in the type (s.n.), and (8632) in the variety *amboinensis.* (*T. amboinensis,* Blume: Hook. f., Fl. Brit. Ind. 5, p. 484).

MORACEAE.*

Ficus rostrata, Lamk.: Hook. f., Fl. Brit. Ind. 5, p. 520: Koorders, 2, p. 110: Merrill, p. 227. A small shrub, distributed from the eastern Himalaya through Burma to the Malay Peninsula, Borneo, Java: and found at Fraser Hill in exposed places, carrying small bright red figs (8599).

Ficus pedunculosa, Miq., reaching ten feet in height with reddish figs (8802) at Fraser Hill.

Ficus diversifolia, Blume: Hook. f., Fl. Brit. Ind. 5, p. 529: Koorders, 2, p. 116: Merrill, p. 529. A small bush distributed from Sumatra through the Peninsula to Borneo, and Java: in the Peninsula it occurs from low levels up to 5000 ft. and it was found at Fraser Hill as a bush up to 10 ft. high in fruit (8920, 8654).

Ficus Burkillii, Ridl. n. sp. A bush with acute leaves, but otherwise near to *F. diversifolia,* at Fraser Hill (8900) and at Pine-tree hill (8529).

Ficus fistulosa, Reinw.: Hook. Fl. Brit. Ind., 5, p. 525: Koorders, 2, p. 120: Merrill, p. 223. A small tree growing in a gully at Fraser Hill in fruit, and with hollowed stems (7886).

*In cosequence of the genus **Ficus** being under revision in Calcutta and the collection belonging to the Singapore Herbarium being on loan the Fraser Hill species cannot be determined fully.

Ficus patens, Ridl., a coarse hairy bush occurring at Fraser Hill in the valley (7776).

Ficus sp. A stiff pubescent bush, with bright red fruits, at Fraser Hill (s.n.).

Ficus fulva, Reinw.: Hook. Fl. Brit. Ind., 5, p. 531: Koorders, 2, p. 117: Merrill, p. 223. A coarse small tree about 20 ft. high with orange to livid figs, in the mined lands of the upper Tras valley about 3500 ft. (7864).

Ficus globosa, Bl.: Hook. Fl. Brit. Ind., 5, p. 503: Koorders, 2, p. 103: Merrill, p. 224. A small tree with big figs, found in the mine area of the upper Tras valley (7872).

Ficus chartacea, Wall.: Hook. Fl. Brit. Ind., 5, p. 533. A bush eight feet high with orange-red figs upon upright branches, at Fraser Hill (7789).

Ficus sp. A pyramidal bush six feet high with brown fruits (8555).

Conocephalus suaveolens, Blume: Hook. f., Fl. Brit. Ind. 5, p. 545: Koorders, 2, p. 122: Merrill. p. 229. A big woody climber, distributed from the eastern Himalaya and Indo-China southwards to Sumatra, the Malay Peninsula, Java, Borneo, and the Philippines: in the Peninsula common widely. At Fraser Hill plentiful.

URTICACEAE.

Pouzolzia viminea, Wedd. Hook. Fl. Brit. Ind., 5, p. 581: Kooders, 2, p. 144: Merrill, p. 233. Shrub about 8 ft. high upon a clearing at 4200 ft. (8948).

JUGLANDACEAE.

Engelhardtia spicata, Blume: Hook. f., Fl. Brit. Ind. V, p. 595: Koorders, 2, p. 51: Merrill, p. 210. A tree, distributed from the central Himalaya, south through Indo-China into the Malay Peninsula, Java, Borneo and to the Philippines. In the Peninsula it is only on the Main range of Perak. At Fraser Hill it is frequent and so also on G. Ulu Semangkok. Ripe fruits were falling.

FAGACEAE.

Quercus sp. near *Q. semiserrata*, Roxb., collected flowerless, a tree about 50 ft. high upon a north slope at Fraser Hill (7753).

Quercus turbinata, Blume: Gamble, Mat., 75, p. 410: Koorders, 2, p. 60. A tree, occurring in Sumatra and in the Malay Peninsula: in the Peninsula found in Penang and on the Main range in Ulu Batang-padang and now at Fraser Hill (8661). It should be collected more for a better understanding.

Quercus cyrtorhyncha, Miq.: Merrill, p. 212: *Pasania cyrtorhyncha*, Gamble, Mat., 75, p. 432. A tree, distributed from Sumatra through the Malay Peninsula and Borneo to Mindanao in the Philippines. In the Peninsula occurring submontanely from

Perak southwards, and to Singapore. At Fraser Hill and below towards the Gap, an oak without flowers and without fruit was found which appears as if this (7783, 7836).

Quercus rassa, Miq.: Koorders, 2, p. 59: Merrill, p. 215: *Pasania Rassa*, Gamble, Mat., 75, p. 436. A tree distributed in western Malaysia from Sumatra, the Malay Peninsula, to west Java and to Borneo. In the Peninsula montane, occurring on Penang, on the Taiping hills, on G. Tahan, on the Main range from Fraser Hill into Negri Sembilan, on Benom, and then at low levels in southern Johore. It reaches 6000 ft. on G. Tahan. At Fraser hill it is common tree (s.n.).

Quercus lucida, Roxb.: *Pasania lucida*, Gamble, Mat., 75, p. 440. A tree, endemic, very common in Penang and extending thence southwards to Singapore, ascending the mountains and recorded as upon G. Batu puteh at 3000 ft. It occurred at Fraser Hill on the ridges, but as the acorns were fallen ones not attached to the parent, there is a trifle of doubt as to the determination (s.n.).

Quercus encleisacarpa, Korth.: *Pasania encleisacarpa*, Gamble, Mat., 75, p. 449. A tree with a wide top and brittle wood, occurring in Sumatra and in the Malay Peninsula: in the Peninsula it occurs at low levels from Penang and Province Wellesley to Singapore. At Fraser Hill it was common in the variety *aperta* (8695).

Quercus beccariana, Benth: Merrill, p. 211: *Pasania beccariana*, Gamble, Mat., 75, p. 453. A tree, with brittle wood, occurring in the Malay Peninsula and in Borneo: in the Peninsula it is said once to have been abundant in Singapore, and it is recorded for Penang. The Fraser Hill specimens have depressed globose acorns (7795) and consequently the identification is somewhat doubtful.

Quercus sp. with very large acorns and cupules covered with processes as in *Q. Wrayi*, found at Fraser Hill (s.n.).

Quercus sp. A tree which was neither in fruit nor in flower (8805).

TAXACEAE.

Dacrydium Beccarii, Parl.: Merrill, p. 30. A small tree occurring in the Malay Peninsula and in Borneo. In the Peninsula it occurs on G. Tahan, on the Main range from G. Bujong Malaka to Pine-tree hill near Fraser Hill (8536), and on Mt. Ophir. On Pine-tree hill it occurs about and on the very top as a tree of 20 ft.

Dacrydium elatum, Wall.: Hook. f., Fl. Brit. Ind., 5, p. 648: Merrill, p. 30. A lofty tree, occurring from Burma and Tonkin to Sumatra, down the Malay Peninsula, in Borneo, the Philippines and in Fiji: in the Peninsula occurring in Penang, on Kedah peak at 3000 ft., on G. Tahan on the Main range in the mountains of Telom, on Mt. Ophir, and on G. Chenik in Pahang. Under Fraser

Hill at about 3400 ft. it occurred as a magnificent tree with a clean straight bole of eighty feet to the first branch, and a total height of one hundred feet and more: it was found also upon G. Ulu Semangkok.

Dacrydium falciforme, Pilger: Merrill, p. 30. A tree, distributed from the Malay Peninsula, in Lingga, through north Borneo to Mindoro in the Philippine islands: in the Peninsula occurring on G. Tahan, and on the Main range in the neighbourhood of the Semangkok pass. It is a most common tree on the vein-quartz ridges of Fraser Hill (8556, 8929), and also elsewhere sometimes sparingly, sometimes in some measure of plenty: ascending above the level of Fraser Hill towards Pine-tree hill: below Fraser Hill it occurs down to 3300 ft. at least and it is on G. Ulu Semangkok. Regeneration appears to be quite free. The Malays call it Kahuwa.

Podocarpus neriifolia, Don.: Hook. f., Fl. Brit. Ind., 5, p. 649: Koorders, 1, p. 65: Merrill, p. 31. A tree, distributed from the Central Himalaya and southern China, to Sumatra, the Malay Peninsula, Borneo, Java, Celebes, the Moluccas, Philippines and to New Guinea. In the Peninsula it occurs as a montane plant in Penang, on G. Tahan as a variety or subspecies, on the Main range from Perak south to Bukit Etam, and on Mt. Ophir. In Java it descends as low as 1200 ft.: but in Penang it exists lower than this. At Fraser Hill it is by no means uncommon (7841, 7856, 8877).

Agathis alba, Foxw.: Koorders, 1, p. 67: Merrill, p. 32: *A. loranthifolia,* Salisb.: Hook. f., Fl. Brit. Ind. 5, p. 650. A lofty tree, distributed in Cochin-china and through the interior of Malaysia, in Sumatra, the Malay Peninsula, Borneo, Java, Celebes, the Moluccas, and the Philippines: in the Peninsula on Kedah peak, in Penang, where it is becoming very scarce, on the Taiping hills, on G. Tahan, on the Main range from near the Semangkok pass, and on G. Chenik in Pahang. Under Fraser Hill it was observed no higher than 3300 ft. upon the west side of the waterparting.

BURMANNIACEAE.

Burmannia longifolia, Becc.: Ridl., Mat., Mono., 2, p. 70: Merrill, p. 133. A herb of mossy places, occurring in the Malay Peninsula and through Borneo to the Philippines and New Guinea: in the Peninsula it occurs on the Taiping hills, on G. Tahan, on the Main range from G. Kerbau and the mountains of Telom to Bukit Etam and on Benom. At Fraser Hill it occurs sporadic, but quite plentifully and was going into fruit (8510): it was also found on G. Ulu Semangkok.

ORCHIDACEAE.

Oberonia pendula, Ridl. in Jour. Str. Br. Roy. As. Soc., 61, p. 38. An epiphyte, endemic and local. It was collected from the neighbourhood of Fraser Hill by Mr. Ridley in 1911 where we got it (7825) in flower and in fruit.

Oberonia spathulata, Lindl. J. J. Smith. p. 238. Distribution in Java, Sumatra, Borneo; occurring as an epiphyte at Fraser Hill (8634).

Liparis compressa, Lindl.: Ridl., Mat., Mono., 1, p. 25: J. J. Smith, p. 280: Ames, p. 153. A herbaceous plant, distributed from Sumatra, in the Malay Peninsula, Borneo, Java Celebes and the Philippines: in the Peninsula occurring in the Taiping hills, and on the Main range from G. Batu puteh to Fraser Hill, where it was found in flower (8893).

Liparis purpureoviridis, Ridl. n. sp. A not uncommon terrestrial plant in the forest (8422) with green purple-veined flowers.

Platyclinis odorata, Ridl., Mat., Mono., 1, p. 28. An epiphyte or on rocks, endemic, occurring on G. Bubu, and on the Main range about Fraser Hill on trees (8423) and below in the upper Tras valley at 3500 ft. on rocks in the sun (8853), plentiful and just in flower.

Dendrobium Kelsalli, Ridl., Mat., Mono., 1, p. 36. A herbaceous epiphyte, endemic, occurring on Kedah peak, apparently in Penang, on the Taiping hills, on G. Tahan, on the Main range from Fraser Hill (8690) to Bukit Etam, on Benom and on Mt. Ophir also on P. Aor off the east coast.

Dendrobium flabellum, Reichb. f.: Ridl., Mat., Mono., 1. p. 36. J. J. Smith, p. 315: Ames p. 189. A herbaceous epiphyte, distributed from Siam to Singapore, in Java and in Borneo, but in need of further study, as being apparently a species in process of breaking up. It is an orchid with flowers that are open for a few hours only in accurate response to some climatic phenomenon: and it is evident that an acceleration or retardation of the rapidity with which the stage between the stimulus and the flowering is passed through, stands for the production of new species as intercrossing is prevented. This seems to be happening: and there seem to be in the Peninsula three subspecies of *D. flabellum*, (1) the plant of Singapore and southern Johore with cream-coloured flowers, the sepals and petals marked with pink spots, the lip cream-coloured with rosy side-lobes (2) the plant of the north with pale green flowers, the sepals and petals spotted with purple, the lip wholly cream and (3) the Fraser Hill plant with the sepals and petals cream-coloured suffused with purple and the lip with the mid-lobe orange. Both the second and the third appeared to have smaller flowers than the first.

Dendrobium atrorubens, Ridl. Mat., Mono. 1, p. 41. A herbaceous epiphyte with a dull cherry-red flower, endemic, found in the Peninsula on Kedah peak, on the Taiping hills, on G. Tahan, on the Main range at Fraser Hill (8672) and on Benom.

Dendrobium hymenopterum, Hook. f.: Ridl. Mat., Mono. 1. p. 52. A herbaceous epiphyte, endemic, on G. Raya in Lankawi, on Kedah peak, on G. Tahan, on the Main range from G. Batu puteh and G. Bujong Malaka to Fraser Hill (8502) and on Benom It was abundantly in flower.

Dendrobium albicolor, Ridl. in Jour. Linn. Soc. Bot. 32, p. 250. A herbaceous epiphyte, known from Lower Siam (Pungah) and now in a pinkish variety from Fraser Hill (7790).

Dendrobium rupicolum, Ridl. in Jour. F. M. S. Mus. 1, p. 184. A small herbaceous epiphyte, occurring on G. Tahan, on the Main range at Fraser Hill (8516) and southwards on Bukit Etam, and on Benom. It was found in flower.

Dendrobium sp. apparently new, a herbaceous wide creeping hirsute epiphyte of a peculiar appearance (7799).

Dendrobium geminatum, Hook. f.: Ridl. Mat., 1, p. 35: J. J. Smith, 346. An epiphyte and on rocks occurring in the Malay Peninsula and in Java: in the Peninsula found on Kedah peak and on the Taiping hills, on G. Tahan, and on the Main range from Ulu Batu Padang to Fraser Hill (7876). Its flowers are of a dull yellow, marked with purple.

Bulbophyllum patens, Hook. f.: Ridl. Mat., Mono. 1, p. 62. A herbaceous epiphyte, endemic, which may be represented by our no. 7792, which was found in fruit upon an oak at Fraser Hill. Until flowers are forthcoming however its occurrence must be doubtful. *B. patens* is in the Peninsula, at low levels from Penang to Singapore.

Bulbophyllum uniflorum, Hassk.: J. J. Smith, p. 443: *B. galbinum*, Ridl.: Mat., Mono. 1, p. 64. A herbaceous epiphyte, in Sumatra, the Malay Peninsula and west Java: in the Peninsula found in the Taiping hills, on G. Tahan at 3300 ft. and on the Main range from the neighbourhood of the Semangkok pass to Bukit Etam; it was found at Fraser Hill in flower (8504).

Bulbophyllum capitatum, Lindl.: Ridl. Mat., 1, p. 73: J. J. Smith, p. 437. Ames, p. 184. A herbaceous epiphyte occurring in Sumatra, in the Malay Peninsula, Borneo and west Java where it is common, being found both at high and low elevations. In the Peninsula it is recorded from Penang, the Taiping hills, G. Tahan, the Main chain from the mountains of Telom to G. Mengkuang lebar, on Benom and on the 1000-feet-high hills near Batu Pahat in Johore. It was found at Fraser Hill (8810) carrying its flame-coloured or yellow flowers.

Bulbophyllum montigenum, Ridl. Mat., 1, p. 76: Ames, p. 188. A herbaceous epiphyte of the Peninsula and Borneo: in the Peninsula hitherto recorded only from Benom, and now recorded also from the Main chain at Fraser Hill (8417), where it was obtained carrying its green flowers.

Bulbophyllum pedicellatum, Ridl. in Jour. Linn. Soc. Bot., 31, p. 278. A herbaceous epiphyte, endemic, occurring in Lower Siam at Poongah and at Khasum, and now found on the Main range at Fraser Hill (7891) coming into flower.

Bulbophyllum minutulum, Ridl. n. sp., a small running herbaceous epiphyte, with straw coloured flowers, found at Fraser Hill (7797).

Bulbophyllum nematocaulon, Ridl. n. sp., a small running herbaceous epiphyte with pale green flowers, found at Fraser Hill (8955).

Bulbophyllum sp, apparently a new species, a small running herbaceous epiphyte near *B. tinea*, Ridl., but differing in having slightly smaller flowers and narrower leaves (8676).

Bulbophyllum sp. Apparently a new species (7822).

Ceratostylis gracilis, Blume: Ridl. Mat., Mono. 1, p. 109: J. J. Smith, p. 300. A small herbaceous epiphyte found in the Malay Peninsula and in west Java: in the Peninsula it occurs on Kedah peak, on Bukit Serava which adjoins Bukit Mertajam in Province Wellesley, on the Taiping hills and G. Bubu, on G. Tahan, on the Main range from G. Kerbau and the mountains of Telom to G. Angsi; and then down upon the coast in southern Johore. At Fraser Hill it is probably the commonest of all orchids (8449, 8517). The figure in the *Icones Plantarum*, 2098, was drawn from an immature flower, and the spur should be twice as long.

Ceratostylis clathrata, Hook. f.: Ridl., Mat., Mono., 1, p. 111. A small peculiarly tough epiphyte, endemic occurring on the Main range from Ulu Batang Badang to Fraser Hill (7800) and also on Benom.

Calanthe angustifolia, Lindl.: Ridl. Mat., Mono. 1, p. 121: J. J. Smith, p. 205. A terrestrial herb of forests found in Sumatra, the Malay Peninsula and in west Java: found in the Peninsula on Kedah peak, on the Taiping hills, on the Main range from the mountains of Telom to the Semangkok pass and on Benom. At Fraser Hill it occurs sporadic upon the crests of the ridges (8525), and was newly in flower. It was found higher than Fraser Hill towards Pine-tree hill, and in the other direction on G. Ulu Semangkok.

Eria latifolia, J. J. Smith, p. 394: *E. iridifolia*, Hook. f.: Ridl. Mat., Mono. 1, p. 90. A herbaceous epiphyte, in Sumatra, the Malay Peninsula and Java: in the Peninsula found only upon the Main range from G. Bujong Malaka and G. Batu puteh to Fraser Hill (7830), in flower.

Eria major, Ridl. Mat., 1, p. 90: Merrill, p. 172. A herbaceous epiphyte distributed from the Malay Peninsula through Borneo to the Philippines. There are two varieties of it at Fraser Hill one with short leaves (8402) and the other with long leaves (s.n.). The short leaved variety occurs in the Taiping hills. The long-leaved variety occurs there also, and on the Main range from G. Kerbau to the Semangkok pass, and also on Benom. They were obtained in flower, and from Fraser Hill extended towards Pine tree hill.

Eria longifolia, Hook. f.: Ridl. Mat., 1, p. 91. A herbaceous epiphte, montane, found in Sumatra, in the Taiping hills, on G. Tahan, and on the Main range from the mountains of Telom to the Semangkok pass, and also it is on Benom. It is very common at Fraser Hill (8419), and carried its snow-white flowers.

Eria pilifera, Ridl. Mat., Mono., 1, p. 92. A herbaceous epiphyte, in Sumatra, and in the Peninsula before this known only from the Taiping hills, found on the Main range at Fraser Hill (7871), in flower.

Eria pauciflora, Blume: J. J. Smith, p. 387: *E. monticola,* Hook. f.: Ridl. Mat. Mono., 1, p. 95. A herbaceous epiphyte, distributed in west Java and the Malay Peninsula; occurring on Kedah peak, on the Taiping hills, on G. Tahan, on the Main range from Fraser Hill to Bukit Etam, and on Mt. Ophir; then again on P. Aor off the east coast. At Fraser Hill it is very abundant (8416, 8638) and it was found also on G. Ulu Semangkok (8881) in flower everywhere.

Eria floribunda, Lindl.: Ridl. Mat. Mono., 1, p. 96: J. J. Smith, p. 400: Merrill, p. 170. A herbaceous epiphyte, distributed from Tenasserim to the Malay Peninsula in Sumatra, Borneo and through Java. In the Peninsula it occurs in Lower Siam, and down the west coast to Singapore; then again it is on the mountains *e.g.* Kedah peak, the Taiping hills, G. Tahan, and the Main range at Fraser Hill (8406) where it attains twice the size of mangrove-swamp examples.

Eria teretifolia, Griff.: Ridl. Mat. Mono., 1, p. 100: Merrill, p. 174. A herbaceous epiphyte, found in the Malay Peninsula and Borneo: in the Peninsula montane, occurring on Kedah peak, in Penang, on the Taiping hills, on G. Tahan, on the Main range from G. Batu puteh and in the mountains of Telom to G. Tampin, and on Mt. Ophir. At Fraser Hill it is very plentiful (7844, 8595), and was in flower.

Phreatia crassifolia, Ridl. in Jour. F. M. S. Mus., 4, p. 69. A very small epiphyte which is endemic and montane, and has been obtained on the Taiping hills, and on the Main range in the mountains of Telom, and now at Fraser Hill where it was upon a Quercus (7798) in flower.

Spathoglottis plicata, Blume: Ridl., Mat., Mono., 1, p. 117: J. J. Smith, p. 219: Merrill, p. 182. A terrestrial herb, distributed from Sumatra, the Malay Peninsula, Java, Borneo, Celebes, the Moluccas to the Philippines, New Guinea, the Solomon islands and Samoa: in the Peninsula it occurs from Tomoh in Lower Siam down to Singapore at low levels and ascends the mountains somewhat. But Fraser Hill in the valley at 4,000 ft. (7778), the neighbourhood of Fraser Hill at 3,500 ft. towards the Gap, and 3,600 ft. in the upper Tras valley are greater altitudes than others have recorded: however it occurs high in Java. The Fraser Hill plant has the small lip usual in the Peninsula.

Spathoglottis aurea, Lindl.: Ridl., Mat., Mono., 1, p. 118: J. J. Smith, p. 218: Merrill, p. 182. A terrestrial herb, distributed in Sumatra, the Malay Peninsula, Borneo, west and mid Java and the Philippines: in the Peninsula it is montane and occurs on Kedah peak, on the Taiping hills, on G. Tahan, on the Main range

from G. Kerbau, G. Batu Puteh to Bukit Etam, and on Mt. Ophir. At Fraser hill it was collected on the face of a landslide (7771), which occurrences are apparently the means by which it persists.

Phaius callosus, Lindl.: Ridl., Mat., Mono., 1, p. 119: J. J. Smith, p. 196. A terrestrial herb of forests by water, found in the Malay Peninsula and in west Java: occurring in the Peninsula on the Taiping hills and on the Main range at Fraser Hill (7820), in flower.

Agrostophyllum callosum, Reichb. f.: Ridl., Mat., Mono., 1, p. 108. A herb of rocks or an epiphyte distributed from the central Himalaya through Burma to the Malay Peninsula, montane; occurring in the Peninsula on Kedah peak, and in the Main range from near Fraser Hill to Bukit Etam. Under Fraser Hill it was found in the old mines of the upper Tras valley (7877), in fruit.

Agrostophyllum bicuspidatum, J. J. Sm.: *Podochilus callosa,* Schlechter: Ridl. Mat. Mono., 1, p. 197: J. J. Smith, p. 286: Ames, p. 76. A herbaceous orchid of mossy places, distributed from Tenasserim, in Sumatra, the Malay Peninsula, Java, Borneo and Celebes; in the Peninsula montane in the north, as on Penang hills, on the Taiping hills, on G. Tahan, on the Main range from the mountains of Telom to Bukit Sutu in Negri-Sembilan, and on Mt. Ophir: then at low levels in Johore and Singapore. It was collected near Pine-tree hill (8523) in flower.

Ceratostylis cryptantha, Ridl. Mat. Mono., 1, p. 110. A small epiphyte, endemic, occurring in Penang, on the Taiping hills, and the Main range near the Semangkok pass. The plant collected by us is larger (8511), and constitutes a variety.

Coelogyne carnea, Hook. f.: Ridl. Mat. Mono., 1, p. 134. A herbaceous epiphyte, endemic, occurring in the Taiping hills, on G. Tahan, and on the Main range from G. Kerbau and the mountains of Telom to G. Mengkuang lebar and also on Benom. At Fraser Hill it is abundant (8501, 8626), and up to Pine tree hill (8644), and also upon G. Ulu Semangkok.

Coelogyne speciosa, Lindl.: Ridl. Mat. Mono., 1, p. 132: J. J. Smith, p. 138: Ames, p. 145. An epiphytic herb, distributed from Sumatra to the Malay Peninsula, to Borneo and through Java: in the Peninsula occurring on Western hill, Penang, on the Taiping Hills, on G. Tahan, on the Main range from the mountains of Telom to the Semangkok pass, and then almost at sea-level in the island of Singapore and in southern Johore. It occurs in Java also at low levels, as well as high. It was found at Fraser Hill not uncommonly (8512).

Renanthera matutina, Lindl.: Ridl. Mat. Mono., 1, p. 156: J. J. Smith, p. 587. A tough epiphyte, but able to use stoney ground under the trees, occurring in Sumatra, the Malay Peninsula and in Java: in the Peninsula found on the Main range from the mountains of Telom to the neighbourhood of the Semangkok pass. At Fraser Hill it was found on a vein-quartz ridge (8938) in flower.

Saccolabium bigibbum, Ridl. in Mat., 1, p. 164, but not of Hook. f. A herbaceous epiphyte endemic and montane found on the Taiping hills, on G. Tahan, on the Main range at Fraser Hill (8503) and on Benom. This orchid wants a new name. It was in flower.

Appendicula, apparently a new species, found as a rigidly erect plant of a bronze colour upon the ground in the mined area of the upper Tras valley at about 3600 ft. (8856).

Anoectochilus Reinwardtii, Blume: Ridl. Mat. Mono., 1, p. 312: J. J. Smith, p. 96. A terrestrial herb of the floor of the forest, distributed in Sumatra, the Malay Peninsula, in west Java and Amboyna: in the Peninsula found on Kedah peak, on the Taiping hills, and on the Main range from the mountains of Telom to Fraser Hill (8550, 8621).

Anoectochilus sp. An orchid with the habit of the last, apparently undescribed. It was collected at Fraser Hill (7803) and has been collected by Napier at the Semangkok pass.

Cryptostylis arachnites, Blume: Ridl. Mat. Mono., 1, p. 225: J. J. Smith, p. 59: Ames, p. 139. A terrestrial herb, of wide distribution, in Ceylon, in the hills of Assam and down south in the Malay Peninsula, Borneo, Java and the Philippines: in the Peninsula it occurs on Kedah peak, in Penang, on the Taiping hills, on G. Tahan, and on the Main range from G. Batu puteh to Bukit Etam; then southwards at low levels from Malacca to Singapore. At Fraser Hill it was found towards Pine-tree hill (8506), in fruit.

ZINGIBERACEAE.

Globba aurantiaca, Miq.: Ridl. Mat. Mono., 2, p. 7: Merrill, p. 123. A herb, distributed through the interior of western Malaysia, Sumatra, the Malay Peninsula and Borneo: in the Peninsula it occurs in Penang from 1000 ft. upwards, on the Taiping hills, on the Main range from Fraser Hill to G. Tampin and under it on the west side; then in the south of the Peninsula at low levels to the Straits of Johore. At Fraser Hill it is not uncommon (8429).

Globba cernua, Baker: Ridl. Mat. Mono., 2, p. 8. A herb, endemic and montane, occurring in the south of Lower Siam, on the Taiping hills, on the Main range from the mountains of Telom and G. Kerbau to G. Angsi. It was found in flower between Fraser Hill and Pine-tree hill (8431).

Camptandra ovata, Ridl. Mat. Mono., 2, p. 12. A small herb of the floor of the forest, endemic, and confined to the Main range from G. Kerbau to G. Mengkuang lebar. It is common at Fraser Hill (8639) and its pure white flowers open in the late afternoon, closing again before dawn.

Hedychium malayanum, Ridl. n. sp. A herb, undescribed, which was collected first a couple of years ago by Mrs. Ferguson-Davie at Fraser Hill, and was obtained by us in the upper Tras valley under Fraser Hill (7875) in an area which had been mined.

Amomum ochreum, Ridl. Mat. Mono., 2, p. 32. A herb, endemic, found upon the Main range in the upper Tras valley under Fraser Hill (8862) upon a mine area at 3300 ft. at Ginting Bidai west of Kuala Lumpur, and on Bukit Galing near Kuantan. It was in flower.

Hornstedtia grandis, Ridl. Mat., 2, p. 36. A giant herb, 20 feet high, endemic, occurring in the Taiping hills, and on the Main range from the mountains of Telom to Fraser Hill (8584). There is just so much doubt about this identification as is due to the want of corollas, as the flowers were all over.

Zingiber spectabile, Griff.: Ridl. Mat., 2, p. 26. A herb, found in Sumatra and the Malay Peninsula, occurring in the Peninsula in the lowlands all down the west side from Perlis and Penang to Malacca, and lately found in north-eastern Pahang. It has not been obtained before this as high in the mountains as Fraser Hill (8666). It is used by the Malays locally as a flavouring, calling it Tepus tundok or nodding ginger.

Zingiber gracile, Jack: Ridl. Mat. Mono., 2, p. 29. A herb, more or less montane in the north of the Peninsula, where it occurs in Penang, on the Taiping hills, on G. Tahan, and on the Main range from Fraser Hill to G. Tampin and on Mt. Ophir: it occurs down to the foot of the hills, and southwards on G. Pulai and in Singapore island. It is not uncommon about Fraser Hill, with yellow bracts when in flower (8806) and these redden in fruit-ripening (8633).

Zingiber Griffithii, Baker: Ridl. Mat. Mono., 2, p. 29. A herb, endemic, occurring in the low country from Penang to Singapore, and on the lower slopes of the hills Its occurrence at Fraser Hill (8808) adds greatly to its recorded spread upwards. It was found in fruit, with reddish magenta bracts.

Alpinia Murdochii, Ridl. Mat. Mono., 2, p. 50. A herb, endemic, occurring on G. Tahan, and on the Main range in the neighbourhood of the Semangkok pass. At Fraser Hill it was found in flower (8671), and between the Gap and G. Ulu Semangkok it was found in fruit (8868).

Alpinia petiolata, Baker; Ridl. Mat. Mono., 2, p. 53. A herb, endemic, distributed in the Peninsula in the Taiping hills, on G. Tahan, and on the Main range from G. Horan and Fraser Hill to G. Tampin. At Fraser Hill it is very common, but was only rarely in flower or in fruit (8434, 8596).

Geostachys secunda, Ridl. Mat. Mono., 2, p. 44. A herb, endemic, found on the Main range from G. Bujong Malaka to the Semangkok pass; very common at Fraser Hill (8636) and in flower. This species is replaced by very closely allied species upon other ranges on the Peninsula.

MUSACEAE.

Musa violascens, Ridl. Mat. Mono., 2, p. 64: Merrill, 120. A giant herb, distributed in Sumatra, the Malay Peninsula and in Borneo: in the Peninsula common at low elevations down both

sides and ascending the mountains to about 4000 ft. · At Fraser Hill it is very common (8598). It is called Pisang toh.

Musa malaccensis, Ridl. Mat. Mono., 2, p. 63: A giant herb, endemic, and rather larger than the last, also a little more of a woodland plant, endemic, occurring in the Peninsula commonly in hill lands down both sides from Pulau Adang, Kedah and Kuantan southwards. It is very common at Fraser Hill and carried flowers and fruit (8858). It is called Pisang jahit or thread plantain.

AMARYLLIDACEAE.

Curculigo latifolia, Dryand.: Ridl. Mat. Mono., 2, p. 66. Merrill, p. 117. A herb found in Burma, the Andamans, the Malay Peninsula and Borneo: in the Peninsula it occurs all down both sides to Singapore: it occurs also on G. Kerbau and in the mountains of Telom and southwards along the Main range to G. Angsi. It is not uncommon at Fraser Hill (s.n.).

TACCACEAE.

Tacca cristata. Jack: Rild. Mat. Mono., 2, p. 77. A herb distributed from Tenasserim to Sumatra and the Malay Peninsula, in the Peninsula occurring in the low country down to Singapore, but it has not been collected from the low country on the east side: it occurs in the mountains of Telom and doubtless in the mountains elsewhere. Under Fraser Hill it was found towards the Gap at 3500 ft. in flower (7765). The hill plants are larger than the plains plants.

DIOSCOREACEAE.

Dioscorea laurifolia, Wall.: Ridl. in Mat. Mono., 2, p. 83. A herbaceous climber, endemic occurring in the Peninsula from Penang to Singapore, preferring the tops of hills, but also descending to sea-level in well-drained places. At Fraser Hill it is very common following clearing, and not rare in the undisturbed forest; its pleasantly scented flower-spikes were to be seen in great abundance (8401, 8433).

Dioscorea sp. with the appearance of *D. pyrifolia,* Kunth, but with large tubers that carry a brown tanning or tinctorial substance and called therefore Gadong Sanak by the Malays who make some use of them. This Dioscorea reaches 4000 ft. at Fraser Hill but is somewhat more easily found in hollows by water at lower levels both towards the Gap and in the upper Tras valley, where it bore flowers (7860, 7889, 8432, 8945).

LILIACEAE.

Smilax calophylla, Wall.: Ridl. Mat., 2, p. 102. A climber, endemic, a montane species in the north of the Peninsula, occurring on Kedah peak, on the Taiping hills, from 1000 to 1500 ft., on G. Tahan, on the Main range about the Semangkok pass, and to G. Mengkuang lebar, on Benom and on Mt. Ophir, then in the lowlands of Johore and Singapore. It was observed to be not uncommon on G. Ulu Semangkok, and down to the Gap (8867).

Smilax laevis, Wall.: Ridl. Mat. Mono., 2, p. 103: Merrill, p. 116. A climber occurring in China and down to the Malay Peninsula, and Borneo: in the Peninsula montane occurring on Kedah peak, in Penang, on the Taiping hills, on G. Keledang near Ipoh, on the Main range from the mountains of Telom to G. Mengkuang lebar, and on Mt. Ophir. At Fraser Hill it was in fruit (8578).

COMMELINACEAE.

Commelina nudiflora, Linn.: Ridl. Mat. Mono., 2, p. 115: Koorders, 1, p. 277: Merrill p. 112. A pantropic herb, which grows freely at the Gap but appears not to have ascended yet further in the direction of Fraser Hill (s.n.).

Forrestia gracilis, Ridl. Mat. Mono., 2, p. 123. A herb, endemic, a lowland plant occurring from Kedah and Pahang to Singapore. It is not uncommon at Fraser Hill up to 4200 ft. (8869) and in fruit.

PALMAE.

Nenga macrocarpa, Scortechini: Ridl. Mat., 2, p. 145. A palm of moderate size, endemic and in the north of the Peninsula montane occurring on Koh Gah in Lower Siam, on Kedah peak, in Penang upon the very tops of the hills, on the Taiping hills, on G. Tahan and under it, on the Main range from G. Bujong Malaka to G. Tampin, on G. Keledang over Ipoh, on G. Pantai and also in Johore down to sea level. At Fraser Hill by no means uncommon (8609).

Pinarga Scortechinii, Becc.: Ridl. Mat. Mono., 2, p. 138. A palm of about 10 ft. in height, endemic and montane: it occurs in Penang, on the Taiping hills, on Bukit Kapayang near Sungei Siput, on G. Tahan, on the Main range from G. Kerbau and the mountains of Telom to Negri Sembilan; then down at the coast in southern Johore. It occurs freely at Fraser Hill and carried its cherry-red fruits (7885).

Pinanga polymorpha, Becc.: Ridl. Mat. Mono., 2, p. 138. A rather small palm, endemic, and montane, occurring on the Taiping hills, and on the Main range from the mountains of Telom to Bukit Etam. It is plentiful at Fraser Hill (8592, 8617); and with fruit ripening the peduncle becomes a brilliant scarlet.

Pinanga paradoxa, Scheff.: Ridl. Mat. Mono., 2, p. 141. An endemic palm, montane and submontane, occurring on Kedah peak, on the Taiping hills, on the Main range from G. Batu putch to G. Angsi, on Mt. Ophir and on G. Pantai. It is common at Fraser Hill and the peduncle, which goes a brilliant red as the fruit ripens, makes it conspicuous (8618).

Caryota obtusa, Griff. Ridl. Mat. Mono., 2, p. 157. A beautiful tall palm, endemic in the Peninsula on the Taiping hills, the Main range from G. Batu putch to the neighbourhood of Kuala Lumpur, and on G. Pantai in Johore. At Fraser Hill it occurs in hollows certainly up to 4200 ft.; and about 3300 ft. some very fine examples were seen.

Licuala pusilla, Becc.: Ridl. Mat. Mono., 2, p. 164. A small palm, endemic, occurring on the Taiping hills, on G. Tahan and on the Main range about Ulu Bubong and the Semangkok pass. At Fraser Hill it is very common (7842, 8426) it was in flower and in fruit, and produced stems attaining 2 ft.

Calamus javensis, Blume: Koorders, 1, p. 234: Merrill, p. 75: *C. penicillatus*, Roxb.: Ridl. Mat. Mono., 2, p. 191. A rattan distributed in Sumatra, the Malay Peninsula, Borneo and west and mid Java: in the Peninsula it is montane in the north, on G. Raya in Lankawi, Penang, the Taiping hills, the Main range from G. Batu puteh and the mountains of Telom to G. Angsi, and southwards both on hills and down to sea level in Singapore island. At Fraser Hill it seems uncommon: it occurs (7814) in the variety *peninsularis*, which is characteristic of the Peninsula.

Calamus luridus, Becc.: Ridl. Mat. Mono., 2, p. 198: Merrill, p. 75. A rattan of about 25 ft. in length occurring in the Malay Peninsula and in Borneo: in the Peninsula it is usually found at low levels from Taiping to Singapore. At Fraser Hill it was collected as no. 8807: but there is just a little doubt in regard to the determination. The Malays with us called it Rotan lilin or wax rattan.

Calamus perakensis, Becc.: Ridl. Mat. Mono., 2, p. 202. A rattan about 20 ft. long, which is endemic, and (including part of *C. lanata*, Ridl. in it) has the following distribution:—Bukit Kapayang near Sungei Siput, and the Main range from the mountains of Telom to Bukit Etam. It was found at Fraser Hill in flower (7757) and in fruit (8421).

Calamus distichus, Ridl. Mat. Mono., 2, p. 206. A rattan of about 15 ft. in length, endemic and local: at Fraser Hill not uncommon, carrying its curiously long (5 ft.) inflorescences (8683 and s.n.).

Calamus brevispadix, Ridl. Mat. Mono., 2, p. 207. A small very spiny rattan only a few feet high, endemic and local. At Fraser Hill it is plentiful and was in flower (8420, 8551).

Daemonorrhops sp. A species of this genus occurs, but has not been determined (7785).

Plectocomia sp. possibly *P. Griffithii*, Becc., is not uncommon about Fraser Hill as it appears to be in the mountains of Telom.

FLAGELLARIACEAE.

Joinvillea borneensis, Becc.: Merrill, p. 109: *J. malayana*, Ridl. Mat. Mono., 3, p. 151. A big grass-like plant 6-8 ft. high occurring in the Malay Peninsula, Borneo and Palawan: in the Peninsula occurring in the Taiping hills, and on the Main range from G. Kerbau and the mountains of Telom to the Semangkok pass.. It occurs at Fraser Hill at 4000 ft. (8649).

PANDANACEAE.

Pandanus collinus, Ridl. Mat. Mono., 2, p. 228. A small tree, endemic and montane in the Peninsula, occurring on Kedah

peak, and on the Main range from the mountains of Telom to the Semangkok pass. At Fraser Hill it was not identified; but it was got in fruit on G. Ulu Semangkok (8876).

Freycinetia lucens, Ridl. Mat. Mono., 2. p. 233. A woody climber, endemic, chiefly of the low country along the west side of the Taiping hills and the Main range from Perak to Singapore, now found in flower upon the summit of Pine-tree hill at 4800 ft. (8546), and sterile between that hill and Fraser Hill.

ARACEAE.

Arisaema Scortechinii, Hook. f.: Ridl. Mat. Mono., 3. p. 8. A herb, endemic, montane, occurring in Penang, and on the Main range from G. Bujong Malaka to G. Tampin. At Fraser Hill it is not uncommon (8665), and was newly in flower.

Amorphophallus sp. The leaves of a species of this genus were seen not uncommonly in the forest at Fraser Hill.

Alocasia Beccarii, Engl.: Ridl. Mat. Mono., 3, p. 16: Merrill, p. 104. A herb of deep shade found in Sumatra, the Malay Peninsula and in Borneo: in the Peninsula montane occurring in the Taiping hills, and on the Main chain from the mountains of Telom to Bukit Etam. At Fraser Hill not uncommon and generally in fruit (8425).

Alocasia Lowii, Hook. f.: Ridl., Mat., Mono., 3, p. 18: Merrill, p. 105. A herb, distributed in the Malay Peninsula, Borneo and Java: in the Peninsula in Perlis, and down the Main range from Perak to the south end, and in Malacca; also in P. Tiuman. Below Fraser Hill it occurs at 3300 ft. on the road to the Gap and at 3800 ft. in the upper Tras valley.

Colocasia esculentum, Schott: Merrill, p. 106: *C. antiquorum,* Schott: Ridl., Mat. Mono., 3, p. 16: Koorders, 1, p. 136. A herb, widely cultivated and wild in tropical Asia: run wild in Sumatra, the Peninsula, Borneo and other parts of Malaysia. In the upper Tras valley to about 3800 ft. it is plentiful.

Homalonema humilis, Hook. f.: Ridl. Mat. Mono., 3, p. 25: Merrill, p. 94. A small herb, occurring in the Malay Peninsula and in Borneo: in the Peninsula montane and submontane, in Penang, on the Taiping hills, on the Main range from the mountains of Telom to the neighbourhood of Kuala Lumpur and in the low country under the hills. At the Semangkok pass in the vicinity of the Gap it occurs (7879) in a race which approximates to *H. pumila,* Hook. f.

Schismatoglottis sp. What seems to be an unnamed plant of the Main range and the Taiping hills was obtained (8696).

Anadendrum montanum, Schott.: Ridl. Mat. Mono., 3, p. 36: Koorders, 1, p. 252: Merrill, p. 88. An epiphyte, more or less herbaceous, found in Tenasserim, and Siam, Sumatra, the Malay Peninsula, Borneo, Java, Celebes: in the Peninsula it occurs on G. Rava in Lankawi, on Kedah peak, in Penang, on the Taiping hills, on the hills over Ipoh and Sungei Siput, on the Main range from the mountains of Telom to G. Tampin, and at low levels further south to Singapore. At Fraser Hill it was found in flower.

Raphidophora Korthalsii, Schott: Ridl. Mat. Mono., 3. p. 45: Koorders, 1, p. 255: Merrill, p. 89. An epiphyte of considerable size, distributed chiefly in the interior of western Malaysia *i.e.* in the Peninsula and in Borneo but reaching west Java in one place: in the Peninsula it occurs in Penang, but has not been collected there in recent years, on the Taiping hills, in the Main range about the Semangkok pass, on P. Tinggi and in Singapore island. It was found between Fraser Hill and the Gap at 3500 ft. in the edge of a gully, in flower (7761).

Raphidophora Wrayii, Hook. f.: Ridl. Mat. Mono., 3. p. 42. An epiphyte of some size, endemic, occurring in Penang, on the Taiping hills, and on the Main range from G. Batu puteh and the mountains of Telom to Fraser Hill (7859) where it is not uncommon and was in flower and fruit.

Pothos salicifolia, Ridley sp. nov. with almost linear leaves and dull yellow fruit (7827) at Fraser Hill.

Scindapsus Scortechinii, Hook. f.: Ridl. Mat. Mono., 3, p. 38. A big epiphyte, endemic, and montane, occurring in the Bandon province of Siam at 4000 ft., on Kedah peak, in the Taiping hills, and on the Main range from G. Bujong Malaka and the mountains of Telom to Bukit Etam. At Fraser Hill it was in flower and fruit (8659, 8934) and extended to the summit of Pine-tree hill (8547).

CYPERACEAE.

Cyperus rotundus, Linn.: Ridl. Mat. Mono., 3, p. 68: Merrill, p. 56: *C. rotundatus,* Linn.: Koorders, 1, p. 190. A herb, pantropic, in the Peninsula occurring here and there. At Fraser Hill not common (7893).

Kyllingia brevifolia, Rottb.: Ridl. Mat. Mono., 3. p. 58: Merrill, p. 58: *Cyperus brevifolius,* Suringar: Koorders, 1, p. 185. A small herb, pantropic and into warm regions generally except south Europe: in the Peninsula general in the low country, but except that it has been collected before on the top of the hills in Penang and at 4000 ft. on G. Kerbau with no montane records, but to be expected at all elevation as the result of the invasion of man. At Fraser Hill it is found about the mined area (7853).

Fimbristylis annua, R. and S.: Merrill, p. 60: *F. diphylla,* Vahl: Ridl. Mat. Mono., 3, p. 91: Koorders, 1, p. 199. A herb, pantropic, very common through the Peninsula and reaching Fraser Hill (8953) as a new intruder, being found chiefly upon bullock-droppings.

Hypolytrum latifolium, L. C. Rich.: Ridl. Mat. Mono., 3, p. 100: Koorders, 1, p. 184: Merrill, p. 54. A herb, distributed in southern India and Ceylon, in north eastern India and China and southwards to the Malay Peninsula, Borneo, west Java and to Australia and parts of Polynesia: in the Peninsula it is common through the low country and has been collected at 2000 and 3500 ft. on G. Kerbau, on Hermitage hill and on the Penang hills. It was not found at Fraser Hill but at 3000 ft. near the Gap (8885) in young fruit.

Gahnia javanica, Moritzi: Ridl. Mat. Mono., 3, p. 99: Koorders, 1, p. 202: Merrill, p. 63. A herb, distributed from Sumatra through the Peninsula, Borneo, west and mid Java to New Caledonia and Fiji: in the Peninsula montane found on Kedah peak, in Penang at 2500 ft., on the Taiping hills, on G. Tahan, on the Main range from G. Kerbau and G. Batu puteh to Bukit Etam, on Mt. Ophir, and in Johore upon quite low hills, even on Bukit Panggerang at the extreme south. At Fraser Hill it is exceedingly common in cleared places (7768), but very rarely in flower.

GRAMINEAE.

Paspalum conjugatum, Berg. Ridl. Mat. Mono., 3, p. 124: Koorders, 1, p. 121. A herb, pantropic, in the Peninsula very common at low elevations; but of its occurrence in the hills there seems to be but two records which are both Mr. Ridley's, one of his finding it at Padang Batu on Mt. Ophir and the second of finding it on Sakai clearings in the mountains of Telom. At Fraser Hill it is the commonest of all grasses about the houses (s.n.).

Paspalum sanguinale, Lam.: Ridl. Mat. Mono., 3, p. 125: Koorders, 1, p. 127. A pantropic herb, in the Peninsula common at low elevations, but scarcely recorded as in the hills. At Fraser Hill it is rare at present, and the place in which it is found is bullock-droppings upon the roads (8952).

Paspalum longiflorum, Rotz. Ridl. Mat. Mono., 3, p. 126: Kooders, 1, p. 121: Merrill, p. 43. A herbaceous weed of wide distribution through the warm parts of the Old World: in the Peninsula said to be common. At Fraser Hill a weed in the vegetable garden (7849).

Panicum indicum, Linn.: Ridl. Mat. Mono., 3, p. 134: Koorders, 1, p. 132. A herb distributed from India in general to the Pacific: in the Peninsula a common weed, which has been recorded as reaching 3000 ft. on G. Kerbau. At Fraser Hill it is abundant on cleared ground (7845).

Panicum plicatum, Lam.: Ridl. Mat. Mono., 3, p. 136: *P. palmifolium,* Koen.: Koorders, 1, p. 135. A herb, in Ceylon, in the moister Himalaya, China and southward to the Malay Peninsula, Java: in the Peninsula it occurs not uncommonly at low levels. Under Fraser Hill it was found at 3500 ft. in the mined area of the upper Tras valley.

Isachne albens, Trin. The second in abundance of the intruding grasses of Fraser Hill. It occurs on G. Tahan and on G. Hijau, in the Taiping hills, and has probably reached Fraser Hill in vegetable seeds from the Taiping hill-garden. It is now common on roadsides at Fraser Hill (7767).

Imperata cylindrica, Bauv: Merrill, p. 38: *I. arundinacea,* Cyrillo: Ridl. Mat. Mono., 3, p. 152: Koorders, 1, p. 102. A pantropic grass, everywhere in the Peninsula. This—the tall lallang

grass probably reached the neighbourhood of Fraser's bungalow many years ago; but it does not thrive to the exclusion of everything else there, and though common in that part of Fraser Hill is not general: it is more plentiful in the upper Tras valley.

Pogonatherum paniceum, Hack.: Merrill, p. 40: *P. saccharoidium*, Brauv., Ridl. Mat. Mono., 3, p. 154: Koorders, p. 107. A small grass widely distributed from India to Japan and southwards to Malaysia, where it is wide spread. Under Fraser Hill in the mined lands of the upper Tras valley it is plentiful.

Sporobolus indicus, R. Br.: Ridl. Mat. Mono., 3, p. 171: Koorders, 1, p. 146. A pantropic herb; in the Peninsula sporadic through the lowlands. At Fraser Hill it is not uncommon about clearings (s.n.).

Eleusine indica, Gaerttn.: Ridl. Mat. Mono., 3, p. 174: Koorders, 1, p. 153: Merrill, p. 50. A pantropic weed, common in the lower country of the Malay Peninsula. At Fraser Hill invading the roads from the droppings of bullocks.

Phragmites Karka, Trin.: Ridl. Mat. Mono., 3, p. 175: Koorders, 1, p. 156: Merrill, p. 50. A large grass widely distributed through the tropics of the Old World. In the upper Tras valley over mined lands at 3300-3800 ft.

Lophatherum gracile, Brongn: Ridl. Mat. Mono., 3, p. 181: Koorders, 1, p. 160: Merrill, p. 52. A grass distributed in southern India and Ceylon, in the eastern Himalaya and to Japan, southwards through Burma to the Malay Peninsula, Borneo, the Philippines and New Guinea: in the Peninsula found widely in the South; but in the north montane, being on Chong in west Siam at 2500 ft., on Kedah peak and on the Taiping hills. At Fraser Hill it is not uncommon.

Dendrocalamus pendulus, Ridl Mat. Mono., 3, p. 192. A graceful bamboo, half sprawling occurring in the Main range from the mountains of Telom to the neighbourhood of Kuala Lumpur. At Fraser Hill it reaches 4100 ft. (7892), but as it was not in flower doubt attaches to the identification.

Schizostachyum latifolium, Gamble: Ridl. Mat. Mono., 3, p. 190: Koorders, 1, p.179. A rather short bamboo distributed in the Peninsula and thought that it may be possibly in Java: in the Peninsula it occurs on G. Tahan, and on the Main range from G. Kerbau to the Semangkok pass and at low level in Malacca. Under Fraser Hill it ascends to 3500 ft. on the Selangor side of the range (7774).

CRYPTOGAMS.

The nomenclature of the ferns is that adopted by van Alderwerelt. Distributions of mosses are taken from Brotherus' monograph on the Bryales in Engler's *Pflanzenfamilien* (I, 3). The works quoted under each species are:—

Van Alderwerelt van Rosenburgh, C. R. W. K., *Handbook to the ferns of the Malay Islands*, Batavia 1908; *Supplement*, 1917; quoted as van Alderwerelt.

Ridley, H. N., A list of the ferns of the Malay Peninsula, *Jour. Straits Branch, R. Asiatic Society* No. 50, 1908; quoted as Ridley.

Ridley, H. N., The Fern-Allies and Characeae of the Malay Peninsula, *Jour. Straits Branch, R. Asiatic Society* No. 80, 1919; quoted as Ridley Fern-Allies.

Beddome, R. H., *Handbook to the ferns of British India*, Calcutta, 1883, with Supplement; quoted as Beddome.

FERNS.

Gleichenia glauca Hk.; van Alderwerelt p. 58, Ridley p. 6, Beddome p. 2. On the Himalayas at 4000-7000 feet, in southern China and Japan, extending through Malaysia to the Philippines, Polynesia and Australia, and in Central America. In Java and in the Peninsula it is a montane species, abundant on the hills from about 1000 feet upwards. Common at Fraser Hill, in the open and in moderate shade (8778).

Gleichenia linearis Clarke; van Alderwerelt p. 59; Ridley p. 7; Beddome p. 4.

Tropical and subtropical, throughout the world. Very common everywhere in the Peninsula. At Fraser Hill quite as abundant as at lower altitudes. A very large form was found by the valley path (8777).

Cyathea moluccana R. Br.; van Alderwerelt p. 15; *C. brunonis* Wall. Ridley p. 7.

Confined to the Malaysian region and the Philippines. In the Peninsula it is common in forests at low altitudes, the highest record being 3300 feet on G. Tahan. It does not occur at Fraser Hill, but is common by roadsides at the Gap (8826).

Alsophila dubia Beddome Suppl. p. 4, van Alderwerelt p. 31, Ridley p. 9.

This species is recorded from Java, Sumatra and Borneo; in the Peninsula it has been collected on the Taiping Hills and on G. Bubu, on G. Tahan, and on the main range from G. Kerbau to Fraser Hill, where it is fairly common in more open places in the jungle (8797, 8813).

Alsophila obscura Scort.: van Alderwerelt p. 34; Ridley p. 9.

Probably endemic. This species was originally found by Scortechini on the Taiping Hills; specimens collected subsequently at other localities appear to be identical with it, but have been referred to *A. comosa* Hk. They are, however, quite distinct from specimens of the latter species from Perak, named at Calcutta, which also agree with Hooker's description and figure (Spec. Fil. Vol. I, p. 53, Pl. 20). Including these specimens which appear

erroneously to have been referred to Hooker's species, *A. obscura* occurs in Penang, on the Taiping Hills, on the main range from Telom to G. Angsi, on Mt. Austin in Johore and on Singapore Island. Some of the fronds from Singapore differ more or less from the typical form of the species, being paler and less coriaceous. At Fraser Hill, it is one of the smaller tree ferns, fairly abundant. (8779, 8796).

Alsophila commutata Mett.; van Alderwerelt p. 34; Ridley p. 8; Beddome p. 14.

Known only from Batjan and Borneo (van Alderwerelt, Supplement p. 59) outside the Peninsula. A montane species, occurring on Kedah peak, Taiping Hills, on the main range from Bujong Malacca to Bukit Kutu, and on Mt. Ophir. A small tree fern, growing on Fraser Hill in partly cleared forest (8793), and in low forest on G. Ulu Semangkok (8912), where it was not found fertile. A curious feature, not mentioned by the authors quoted, but shewn also by Ridley's specimens from Bujong Malacca and Bukit Hitam, is the presence of several much reduced pinnae at the bases of the stipes (cf. a similar feature in *Cyathea Beyrichiana*, figured in Christ, *Geographie der Farne*, Jena 1910, p. 45).

Alsophila Kingii Clarke; van Alderwerelt p. 36; Ridley p. 9; Beddome p. 475.

Endemic. Originally collected on G. Bubu at 5000 feet, and since found on G. Tahan, and on G. Pantai in Johore, (Ridley), but we have no specimen from the last-named locality. Found in a rather open situation on the quartz slope below Reservoir Crest, and not noticed elsewhere (8492). The fertile pinnules are very much reduced.

Alsophila latebrosa Wall.; van Alderwerelt p. 38, Suppl. p. 51; Ridley p. 8; Beddome p. 11.

Occurs on the mountains of southern India from 3000 to 7000 feet, and in northern India from 3500 to 5000 feet, throughout Malaysia to the Philippines and in southern China. On the Peninsula "the commonest tree fern in the low country" (Ridley). It has been found up to 5000 feet on the Taiping Hills, on Penang Island, and at numerous localities in Selangor, Malacca, Negri Sembilan, Johore and Singapore Island. In Java very common up to the middle mountain zone. At Fraser Hill, probably the commonest of the smaller tree ferns (8825, 8794).

Alsophila glauca, J. Sm.; van Alderwerelt p. 41; Ridley p. 8; Beddome p. 12.

Distributed from the hills of northern India and Burma throughout the Malaysian region to the Philippines. In the Peninsula it is a montane species, occurring on G. Raya, Lankawi, the Taiping Hills, on the top of Penang hill, on the main range south to G. Angsi, and on Bukit Soga in Johore. It has also been collected on Pulau Tioman. The largest tree fern in the

Fraser Hill area, frequent in open places in the jungle and especially abundant in the valley which had been formerly cleared for tin mining (8812).

Cibotium barometz J. Sm.; van Alderwerelt p. 48; Ridley p. 10; Beddome p. 24.

Distributed probably throughout Malaysia, in the Philippines, Assam and southern China. In the Peninsula "in woods at no elevation, not rare" (Ridley). It has been collected on Kedah peak at 1100 feet, on the Taiping Hills, at various points on the main range from G. Kerbau to Bukit Kutu, at Klang Gates and on Penang Island. Abundant in cleared places and also in moderate shade, the fronds sometimes as much as 15 feet in length, including the stipe.

Hymenophyllum australe Willd.; van Alderwerelt p. 69 and 797; *H. javanicum* Spr., Ridley p. 11, Beddome p. 32.

Extends from the Himalayas through Malaysia to Australia and New Zealand. In the Peninsula it has been collected on the Taiping Hills, on the main range at Telom and Ginting Sempah, on Mt. Ophir and on G. Pulai in Johore. It was found at Fraser Hill by Mrs. Smith.

Hymenophyllum Blumeanum Spr.; van Alderwerelt p. 71; *H. polyanthos* Sw., Ridley p. 10, Beddome p. 30.

Generally distributed through the rain forest regions of tropical Asia. In the Peninsula found at many localities, on the hills in the north and at lower altitudes in Johore and Singapore. At Fraser Hill this species was collected by Mrs. Smith; the fronds are broad, and do not correspond to Beddome's *H. polyanthos* v. *Blumeanum*.

Hymenophyllum formosum Brack.; van Alderwerelt p. 72; *H. dilatatum* Sw., Ridley p. 11, Beddome Suppl. p. 7.

Extends from Malaysia into the Pacific, to Australia and New Zealand. In the Peninsula it has previously been collected on the Taiping Hills only. It is represented in Mrs. Smith's collection.

Hymenophyllum serrulatum C. Chr.; van Alderwerelt p. 79; *H. Smithii* Hk., Ridley p. 11, Beddome p. 34.

A Malaysian species, extending to New Guinea. In the Peninsula it has been found on the Taiping Hills, on the main range from Bujong Malacca to Bukit Hitam in Selangor, on Penang Hill, G. Benom, and in Johore and Singapore. At Fraser Hill, it is very abundant on trees in the jungle (8451).

Hymenophyllum Neesii Hk.; van Alderwerelt p. 81, Ridley p. 11, Beddome p. 35.

Occurs in Ceylon and Malaysia. In the Peninsula "common on trees, low country up to 4000 feet" (Ridley); it has been collected from numerous localities, including Singapore. At Fraser Hill it is very abundant (8413, 8415).

Trichomanes sublimatum K. Müll.; van Alderwerelt p. 86; *T. muscoides* Sw. var. *sublimatum*, Ridley p. 12.

On the Khasya Hills and through Malaysia to New Guinea. In the Peninsula it is probably widely distributed, and has been found on Bujong Malacca, Mt. Ophir, in the Telok Reserve near Klang, and in Singapore Island. At Fraser Hill it was seen twice, on deeply shaded wet rocks by small streams (9180).

Trichomanes digitatum Sw., van Alderwerelt p. 89, Ridley p. 12; Beddome p. 39.

Found in the Mascarenes, Ceylon, and through Malaysia to Polynesia and Australia. In the north of Peninsula it is only recorded from the hills (Taiping Hills, main range from G. Kerbau to Bukit Kutu, G. Tahan at 4000-5000 feet) but it is found on Singapore Island. At Fraser Hill it is common on tree trunks near the ground, in the forest (8770).

Trichomanes proliferum Bl.; van Alderwerelt p. 90, Ridley p. 13; Beddome p. 39.

On the hills of Ceylon and southern India, in Malaysia and the Philippines. In the Peninsula it has only been recorded from the Taiping Hills, up to 4000 feet. At Fraser Hill found on tree trunks in the forest (8836).

Trichomanes bipunctatum Poir.; van Alderwerelt p. 95, Ridley p. 13, Beddome p. 41.

Occurs in tropical Africa, tropical Asia, Polynesia and Australia. It has been collected in both low and high country, certainly up to 4000 feet, in various parts of the Peninsula, and in Singapore Island. At Fraser Hill it is one of the less abundant species. It is possible that the specimen should be referred to *T. bilabiatum*, an allied species with a more restricted distribution (8833).

Trichomanes maximum Bl.; van Alderwerelt p. 99, Ridley p. 14; Beddome Suppl. p. 10.

A species common to Malaysia, Polynesia and northern Australia. It has been collected on the hills in the Peninsula from G. Kerbau to Johore, but not in the low country. At Fraser Hill collected once only, on shaded rocks above the stream in the valley (8903).

Trichomanes rigidum Sw.; van Alderwerelt p. 102, Ridley p. 13; Beddome p. 44.

A pantropical species, in the Peninsula collected especially from the hill forests, but also found in Singapore Island. At Fraser Hill it is one of the few species which are found in full shade on the ground in the forest, and is abundant (8465).

Trichomanes pluma Hk.; van Alderwerelt p. 106, Ridley p. 14; Beddome Suppl. p. 11.

In Malaysia and Polynesia, extending to New Caledonia. Found in hill forests in the Peninsula on the Taiping Hills, on the main range from G. Berumban to Ginting Bidai, on G. Tahan

and Mt. Ophir, the highest record being 6000 feet on G. Kerbau. At Fraser Hilll it is a fairly common species of the forest floor, occasionally found on the bases of tree trunks (8734).

Oleandra neriiformis Cav.; van Alderwerelt p. 152. Ridley p. 40; Beddome p. 285.

This species is found in tropical Africa and America, on the eastern Himalayas at 2000-5000 feet, through Malaysia to New Guinea and Polynesia. In the Peninsula it is montane, and has been found at nearly all localities where collections have been made. It has a decidedly xerophytic habit and at Fraser Hill was sometimes found in the fern thickets in open places, though usually growing in the jungle, climbing some distance up the tree (8497). The form collected differs somewhat from typical *O. neriiformis*, in that the stipes, which are always very short, are jointed at the base of the lamina. In other respects it agrees with *O. neriiformis* rather than with *O. colubrina*.

Nephrolepis acuminata, Kuhn.; van Alderwerelt, p. 159; *N. davallioides* Kze., Ridley p. 39, Beddome Suppl. p. 81.

Confined to Malaysia and New Guinea. In Java it is a common epiphyte, from the low country to the middle forest zone of the mountains. In the Peninsula it has been collected on the Taiping Hills at 3600-4000 feet, at Telom, and on Bukit Hitam at 4000 feet. At Fraser Hill it is a common epiphyte, growing luxuriantly on the trunks of trees in the jungle, the fronds up to 2 m. in length. It occurs also on the rocks in the open mining valley (8848, 8494).

Nephrolepis cordifolia, Pr.; van Alderwerelt, p. 160, Beddome p. 282.

A pantropical species, occurring throughout the Indian region up to 5000 feet elevation, and in Java a common ground fern in not too deeply shaded or quite open places up to 8000 feet. There are no specimens from the Peninsula in the Singapore herbarium and Ridley does not record it. At Fraser Hill it was found on bare ground, quite in the open (8495).

Nephrolepis exaltata, Schott.; van Alderwerelt, p. 161, Ridley p. 39, Beddome p. 282.

A pantropical species. Abundant at low altitudes at least in the south of the Peninsula, but little collected in the north, except at Penang. It often grows on trees and rocks, with long pendulous fronds. The present writer cannot certainly say what is its frequency and habit at Fraser Hill, but it is probably abundant. Mrs. Smith's specimen in labelled "open space, jungle."

Nephrolepis biserrata, Schott.; van Alderwerelt, p. 162; *N. acuta,* Pr., Ridley p. 39, Beddome p. 284.

A pantropical species. It is very abundant in the south of the Peninsula where secondary growth is beginning to replace cleared jungle; it has hardly been collected in the north except on Penang Island. At Fraser Hill comparatively small plants were noted on cleared ground.

Dryopteris crassifolia, O. Kze.; van Alderwerelt, p. 182; *Lastraea crassifolia,* Ridley p. 35, Beddome p. 238.

Burmah and Malaysia, extending to the Philippines. In the Peninsula it is probably general in the forests of the low country and on the hills to at least 4000 feet. It has been collected on Singapore Island and in the lowland forests of Johore and Malacca, and also on Mt. Ophir and the Taiping Hills. A ground fern of the jungle, noticed only on South Ridge (8765).

Dryopteris calcarata, O. Kze.; van Alderwerelt, p. 185; *Lastraea calcarata,* Beddome p. 235, Ridley p.35.

General throughout southern tropical Asia, Malaysia and the Philippines, extending into Polynesia. In the Peninsula the typical form of the species has only been collected on the Taiping Hills, on G. Kerbau and Ulu Semangkok. At Fraser Hill it is a common ground fern of the jungle, the stem sometimes projecting nearly a foot above the surface of the ground (8736, 8790).

Dryopteris singalanensis, C. Chr.: van Alderwerelt, p. 192; *Lastraea singalanensis* Beddome Suppl. p. 54, Ridley p. 35.

Previously known from the Taiping Hills at 3500-4000 feet, and from Mt. Singalan in Sumatra. At Fraser Hill collected once only, on the open valley-side (8811).

Dryopteris ferox, O. Kze.; van Alderwerelt, p. 221; *Nephrodium ferox* Moore, Beddome p. 279, Ridley p. 38.

In northern India, Malaysia and the Philippines. In the Peninsula it has been collected only on the Taiping Hills at 2000 feet, at Fraser Hill and on Penang Hill. Only one mature specimen was seen (8795), in partially cleared jungle on the valley side, but young plants, probably of this species, were abundant near by.

Dryopteris parasitica, O. Kze.; van Alderwerelt, p. 224; *Nephrodium molle* R. Br., Ridley p. 37, Beddome p. 277.

Pantropical. Common throughout the Peninsula, in the low country and on the hills (8901).

Dryopteris truncata, O. Kze.; van Alderwerelt, p. 227; *Nephrodium truncatum* Pr., Ridley p. 38, Beddome p. 280.

Extends to Madagascar and to Polynesia and Australia. In the Peninsula it has been collected in low country in Perak, and also on the Taiping Hills and on G. Kerbau at 5000 feet, and at low altitudes in Selangor, Johore and Singapore. It was found by Mrs. Smith at Fraser Hill.

Dryopteris heterocarpa, O. Kze.: van Alderwerelt, p. 228; *Nephrodium heterocarpum* Moore, Ridley p. 38, Beddome Suppl. p. 78.

A western Malaysian species, collected in the Peninsula on the Taiping Hills at 2500-3000 feet, at Telom in Pahang, in Negri Sembilan and on the Islands of Penang and Singapore. At Fraser Hill it was only found below 4000 feet, abundantly by the forest path down to the Gap and in the mining valley (8814, 8763).

Mesochlaena larutensis, (Bedd.) van Alderwerelt, p. 232; *Nephrodium larutense* Beddome, Suppl. p. 73, Ridley p. 38.

Reported only from Borneo (Copeland) outside the Peninsula. The species was originally collected on the Taiping Hills, and has since been found at Telom and Ginting Sempah on the main range. It was not noticed at Fraser Hill, but was found once only in the forest at the foot of G. Ulu Semangkok, just above the Gap (8913).

Aspidium pachyphyllum, Kze.; van Alderwerelt, p. 252, Ridley p. 33, Beddome Suppl. p. 46.

A Malaysian and Polynesian species, previously collected in Perak at altitudes from 100 to 1500 feet. At Fraser Hill it was only found by the present writers by the valley path in the edge of the jungle (just below 4000 feet) and always sterile. Mrs. Smith, however, sent a fertile frond, collected at about 4000 feet.

Odontosoria chinensis, J. Sm.; van Alderwerelt, p. 259; *Stenoloma chinensis* Bedd., Ridley p. 19, Beddome p. 70.

In Madagascar, Ceylon and southern India on the mountains, northern India to southern China and Japan, and through Malaysia to the Philippines and Polynesia. In the Peninsula "on banks at considerable altitudes, this plant seems to prefer stiff yellow clays" (Ridley). It has been collected at Jor in Perak, on the main range at the Semangkok pass and Ginting Bidai, by the Tahan river and on Penang Hill. At Fraser Hill abundant in open places on the clay, not usually among the first plants on bare ground (8496).

Lindsaya pectinata, Bl.; van Alderwerelt, p. 269.

Distributed from Assam through Malaysia to the Philippines. This species is hardly distinguishable from *L. scandens* on the one hand and from *L. repens* (with which it is included by Beddome) on the other; the present specimen has exactly the form and habit of *L. scandens* except for a slight lobing of the edge of the leaflets, and consequent interruption of the sori, while specimens from elsewhere with less decurved lower margins of the leaflets grade into *L. repens.* All are creeping or climbing ferns of the jungle and are widely distributed in the Peninsula. *L. pectinata* is common at Fraser Hill (8452); *L. scandens* proper was not noticed.

Lindsaya orbiculata, Mett.; van Alderwerelt, p. 270, Ridley, p. 20, Beddome p. 75.

In Ceylon and southern India, northern India to southern China, and through Malaysia to Australia. In the Peninsula it is a ground fern of the forest, chiefly montane. It has been collected on Kedah Peak at 1000 feet, on the Taiping Hills, on the main range from Bujong Malacca to G. Angsi, on G. Tahan, and on Penang Island. At Fraser Hill it is one of the most constant ground ferns, occurring in quite deep shade (8400).

L. orbiculata var. **polymorpha,** Hk.

No. 8762. This form is equally abundant with the typical form of the species, and in some cases shows transitions to the

latter. The only other specimens of this variety in the Singapore herbarium are from Penang.

Lindsaya decomposita, Willd.; van Alderwerelt, p. 274; *Schizoloma lobata* Beddome, p. 77, Ridley p. 21.

In Ceylon and southern India, through Malaysia to Polynesia and Australia. In the Peninsula not confined to the mountains, at least in the south, being found at low altitudes in Johore and Negri Sembilan. It is difficult to separate this species from *L. davallioides.* At Fraser Hill it occurs along with *L. orbiculata* (8707, 8474). Some specimens show little or no anastomosis of veins.

Humata repens, Diels; van Alderwerelt, p. 288; *H. pedata,* J. Sm., Ridley p. 16, Beddome p. 48.

In the Mascarenes, Ceylon and southern India at 3000-4000 feet, the eastern Himalayas and southern China, and through Malaysia to Australia. In the Peninsula it is not confined to the mountains and has been collected at numerous localities. At Fraser Hill it is a common epiphyte, the fronds frequently rather small (8463).

Davallia bullata, Wall.; van Alderwerelt, p. 303, Ridley, p. 17, Beddome p, 61.

Found on the mountains of southern India, on the eastern Himalayas to 6000 feet, in Burmah, southern China and Japan, Malaysia and the Philippines. In the Peninsula it is montane, occurring on Kedah Peak at 3000-4000 feet, on the Taiping Hills, and on the main range from G. Berumban to Ginting Bidai. At Fraser Hill, a fairly common epiphyte (8706).

Davallia divaricata, Bl.; van Alderwerelt, p, 305, Ridley, p. 17, Beddome p. 60.

Found on the eastern Himalayas and in southern China, Malaysia and the Philippines. In Java it is a common epiphyte, from sea level to the lower forest zone; in the Peninsula it has previously been collected only on the Taiping Hills at 3000 feet. At Fraser Hill, found only at about 3500 feet, in the old mining valley, on granite boulders near the stream (8846).

Tapeinidium pinnatum, C. Chr.; van Alderwerelt, p. 314; *Microlepia pinnata* J. Sm., Ridley p. 18. Beddome p. 64.

In southern India and spread through Malaysia to Polynesia. In the Peninsula it has been found on the Taiping Hills at 2000-3000 feet, on the main range from Telom to G. Tampin, on G. Tahan at 3000 feet, on Penang Hill, Mt. Ophir and G. Pulai, and in Singapore Island. At Fraser Hill collected by Mrs. Smith at about 4000 feet.

Dennstaedtia moluccana Moore, var. **sinuata** Bonaparte; van Alderwerelt p. 146.

A scrambling fern with aculeate rachis found on the cleared hilltop of South Summits at Fraser Hill in a thicket of Pteridium, Gleichenia, etc. (8817) has been identified as above by H. H. Prince

R. Bonaparte. *D. moluccana* has a distribution in Malaysia, Fiji and Formosa; no other record of it from the Peninsula is known.

Hypolepis tenuifolia, Bernh.; van Alderwerelt, p. 336.

This species is distributed from Malaysia to Australia, Polynesia and New Zealand, and occurs also in southern China. The only specimens in the Singapore herbarium from the Peninsula are from Fraser Hill, collected by Mr. Hose, Mrs. Smith and the present writers (8498). It appears doubtful however whether Beddome's *H. punctata* from the Taiping Hills (Beddome, Suppl. p. 19) is really distinct from the present species, as the only difference seems to be in the character of the hairs on the rachis and leaflets. *H. tenuifolia* from Fraser Hill is rather densely covered with viscid glandular hairs.

Histiopteris incisa, J. Sm.; van Alderwerelt, p. 349; *Litobrochia incisa* Pr., Ridley p. 25, Beddome p. 120.

Pantropical. In Ceylon and southern India it occurs on the hills at 3-4000 feet, and on the Khasya Hills to 6500 feet. In Java it extends from the plains to the highest summits. In the Peninsula it has been collected on the Taiping Hills, G. Kerbau, Kedah Peak, and on the Islands of Penang and Singapore. At Fraser Hill it is abundant in the open, young plants being very abundant by the paths, and both the typical form and Beddome's var. *integrifolia* (8499) occur. The latter variety has only been collected previously in Perak.

Pteridium aquilinum (L.) Kuhn.: van Alderwerelt, p. 377; *Pteris aquilina* L., Ridley p. 24, Beddome p. 115.

Distribution worldwide. Abundant in open places all over the Peninsula at all altitudes. At Fraser Hill forming dense thickets, with *Gleichenia* and other ferns, on the cleared hilltops.

Blechnum orientale, L.: van Alderwerelt, p. 387, Ridley, p. 26, Beddome p. 132.

Distributed generally through tropical Asia and through Malaysia to Polynesia and Australia. In southern India it is found on the hills up to 6000 feet, and in Java from sea level up to the summit of G. Gedeh. In the Peninsula it grows only in the open, and is very common almost everywhere. At Fraser Hill young plants are very abundant on newly cleared ground, especially by paths in the jungle (8493).

Diplazium subserratum, Moore; van Alderwerelt, p. 400, Ridley p. 29. Beddome p. 174.

Known only from the Peninsula, Java and Borneo. In Java it is a ground fern of the lower forest zone (3000-5000 feet); in the Peninsula it has been collected on the Taiping Hills, on the main range from Telom south to Ginting Bidai, and on Penang Island. At Fraser Hill, a ground fern of the forest, noticed once only (8902).

Diplazium sylvaticum, Sw.; van Alderwerelt, p. 402, Ridley, p. 30. Beddome p. 177.

A pantropical species. In Java, Raciborski records it from the woods of the low country only. It has been found on the Lankawi Islands, on the Taiping Hills, on the main range at G. Berumban and Bukit Kutu, and at lower altitudes in Pahang, Selangor, Malacca and in Singapore Island. At Fraser Hill it is of local occurrence, a ground fern of the jungle (8818).

Diplazium bantamense, Bl.; van Alderwerelt, p. 405, Ridley, p. 30, Beddome p. 177.

In southern and northern India and southern China, and through Malaysia to the Philippines and the New Hebrides. In Java it is a common ground fern of the lower and middle forest zones, rare in the low country; in the Peninsula it occurs on the Taiping Hills at 3000 feet, on the main range from Perak to Negri Sembilan, in Pahang, and at lower altitudes in Malacca and Singapore. A ground fern of the forest (10018).

Diplazium tomentosum, Bl.; van Alderwerelt, p. 414, Ridley p. 30, Beddome p. 179.

Confined to Burmah and western Malaysia. In the Peninsula it is widely distributed in the lowlands, and also in the hills from Perak to Johore, and in Singapore Island; a ground fern of the forest. Locally abundant at Fraser Hill (8816).

Diplazium speciosum, Bl.; van Alderwerelt, p. 415, Ridley, p. 30, Beddome p. 178.

A Malaysian species (occurring also in Indo-China?), widely distributed in the Peninsula from Kedah to Singapore, both at low altitudes and on the hills, in forests (10019).

Diplazium polypodioides, Bl.; van Alderwerelt, p. 419, Beddome p. 184; *D. asperum* var. *polypodioides,* Ridley p. 31.

Distributed from Ceylon, southern and northern India through Malaysia to the Philippines and to Australia. The distinction between this species and *D. asperum* as found in the Peninsula is not very marked; Ridley has included both as varieties of the same species, though Beddome separates them and considers *D. polypodioides* to be an extreme form of *D. latifolium.* The present specimen (8844), found in the valley near the stream, appears to be nearer typical *D. polypodioides* than others collected in the Peninsula, but has a decidedly rough stipe. The two species together have been found in Penang Island, at Ulu Bubong in Perak, and on the main range at Ulu Temengo and Ginting Sempah.

Diplazium cordifolium, Bl.; van Alderwerelt, p. 422; *Anisogonium cordifolium* Bedd.; Ridley p. 31, Beddome p. 191.

Distributed from tropical Africa through India and Malaysia to Polynesia. In the Peninsula it has been collected chiefly on the hills, in Perak up to 5000 feet and on the main range at several points, but also at lower altitudes in Selangor and on Singapore Island. A ground fern of the jungle, found once only, just below 4000 feet by the valley path (8850).

Diplazium fraxinifolium, Pr.; van Alderwerelt, p. 423; *Anisogonium lineolatum* Mett., Ridley p. 31, Beddome p. 191.

Distributed through Malaysia and the Philippines, and also in Japan (van Alderwerelt). In the Peninsula it is a montane species, collected on the Taiping Hills at 3000-4000 feet, on the main range at Telom and G. Batu Puteh (2000-3000 feet) and on Penang Hill. At Fraser Hill a ground fern of the jungle (8799).

Diplazium proliferum, Thouars v. **accedens** (Bl.); van Alderwerelt p. 424; *Anisogonium decussatum* Beddome, Suppl. p. 40, Ridley p. 31.

Found in tropical Africa and Madagascar, through Malaysia to Polynesia and northern Australia, but not in India. The only other records from the Peninsula are from the Taiping Hills up to 4500 feet and from Telom. Found once only, in moist ground by the valley path, rather in the open (8780).

Asplenium nidus, L.; van Alderwerelt, p. 439; *Thamnopteris nidus* Pr., Ridley p. 26, Beddome p. 137.

Occurs in Madagascar, in tropical Asia generally, and through Malaysia to Australia. It is common on trees throughout the Peninsula, and was of occasional occurrence at Fraser Hill.

Asplenium Scortechini, Beddome, Suppl., p. 27, Ridley, p. 27, van Alderwerelt p. 443.

Endemic and montane, previously collected on the Taiping Hills at 3000-4000 feet, and on the main range at G. Berumban in Pahang. An epiphyte, on tree trunks in the forest, not common (8776).

Asplenium normale, Don; van Alderwerelt, p. 453, Ridley, p. 27, Beddome p. 144.

On the mountains of southern India and Ceylon at 3000-6000 feet, the eastern Himalayas and Khasya Hills, in southern China, and through Malaysia to the Philippines and islands of the Pacific. In the Peninsula found on Kedah Peak, on the Taiping Hills at 5000 feet, and on the main range at Telom. At Fraser Hill fairly common on the ground and on trees near the ground (8464).

Asplenium tenerum, Forst.; van Alderwerelt, p. 458, Ridley, p. 28; Beddome p. 147.

In tropical Africa, Ceylon, and through Malaysia to the Philippines, New Guinea, and Polynesia. In the Peninsula widely distributed and not confined to the hills, found also on Singapore Island. At Fraser Hill it grows on the ground and on trees in the jungle (10020).

Asplenium caudatum, Forst.; van Alderwerelt, p. 460, Ridley, p. 28; Beddome p. 151.

A pantropical species. In the Peninsula it appears to be montane and has only been collected from the Taiping Hills at 2500-4000 feet. At Fraser Hill not common, an epiphyte in the jungle (10021).

Asplenium praemorsum, Sw.; van Alderwerelt, p. 470; *A. furcatum* Thb., Beddome p. 157.

A pantropical species, occurring on the mountains of southern India and Ceylon at 5-7000 feet, and in Java above 7000 feet. It has not previously been recorded from the Peninsula, but a single specimen growing epiphytically at Fraser Hill (8485) seems to be nearer to it than to any other species of Asplenium.

Asplenium nitidum, Sw.; van Alderwerelt, p. 471, Ridley, p. 29, Beddome p. 157.

Occurs in the forests of Ceylon and south India, on the Khasya Hills at 1000-4000 feet altitude, through Malaysia to the Philippines and in the Mascarenes. In Java it is found in the lower and middle forest zones up to 6000 feet. In the Peninsula it has been collected on the Taiping Hills up to 4000 feet, on the Tahan river, on Pulau Tiuman, and at various localities in Johore and on Singapore Island. At Fraser Hill it is epiphytic, and not common (8905).

Phegopteris laserpitiifolia, Beddome, Suppl., p. 84, Ridley, p. 40, van Alderwerelt p. 494.

Endemic and montane. Collected only in Perak (no locality) and on the main range at Telom. A ground fern of the forest, found only once, on Lower North Ridge (8798).

Dipteris conjugata, Reinw.; van Alderwerelt, p. 523; *D. Horsfieldii,* Beddome p. 336, Ridley p. 44.

Throughout Malaysia, extending to the Philippines, New Guinea and Polynesia, and also in Formosa. In the Peninsula "on rocks by the sea, and also on mountain tops" (Ridley). It is found on all the hills in open places at about 3000 feet and upwards, and also on the shores of Singapore Island. At Fraser Hill it was found abundantly in exposed situations both below 4000 feet and on the summit of Pine-tree Hill (8738) the highest point reached (4800 feet). Young plants were noticeable in many places by the forest paths.

Ceropteris calomelanos, Und.; van Alderwerelt, p. 528; *Gymnogramme calomelanos* Klf., Ridley p. 48.

This fern is said to have been introduced into Malaysia through cultivation, its original home being tropical America and Africa. It has been collected at many widely separated localities in the Peninsula, the highest altitude recorded being 4000 feet on G. Kerbau. At Fraser Hill it grows abundantly in open places, and is one of the first vascular plants to establish itself on bare ground (8483).

Monogramme paradoxa, Beddome, p. 315, van Alderwerelt, p. 552; *M. junghuhnii* Hk., Ridley p. 48.

On the mountains of Ceylon and southern India, and through Malaysia to Polynesia and Australia. The only other specimens in the Singapore herbarium are from Penang and Singapore. At Fraser Hill it was collected once only, an epiphyte in the forest (8835), but may have been overlooked on account of its small size.

Vittaria elongata, Sw.; van Alderwerelt, p. 556, Ridley, p. 51, Beddome p. 404.

An epiphyte of the rain forests of tropical Africa and Asia, extending through Malaysia to Polynesia and Australia. In Java it does not occur above 5500 feet. In the Peninsula it is common everywhere, in the low country and the hills, probably up to the upper limit of forest. At Fraser Hill it is one of the most abundant epiphytic ferns, and as usual rather variable (8471).

Vittaria pusilla, Bl.; van Alderwerelt, p. 560; *V. falcata,* Kze., Ridley p. 51, Beddome p. 406.

Occurs in Ceylon, Malaysia, the Philippines and Australia. In Java it is an epiphyte of the middle and upper forest zones, amongst moss, and in the Peninsula it appears to be montane, having been found on the main range at G. Berumban in Pahang and Bujong Malacca, on G. Tahan, G. Benom and Mt. Ophir. At Fraser Hill it is a not uncommon epiphyte, sometimes found with fertile fronds less than 5 cm. in length (8461).

Taenitis blechnoides, Sw.; van Alderwerelt, p. 563, Ridley, p. 52, Beddome p. 410.

Occurs in Ceylon and in northern India, and through Malaysia to the Philippines, New Guinea and Polynesia. "Common in woods all over the Peninsula and very variable" (Ridley). At Fraser Hill it is very abundant, especially by paths in the forest, the simple form being most frequent and large pinnate fronds rare (8735).

Polypodium hirtellum, Bl.; van Alderwerelt, p. 582, Ridley, p. 41, Beddome, p. 305.

Found in Ceylon, Malaysia, the Philippines, and New Caledonia. In the Peninsula and in Java it is montane, an epiphyte of mossy tree trunks; it has been collected on Kedah Peak at 2,500 feet, on the main range at G. Berumban and G. Batu Puteh (6,000 feet), on G. Tahan and Mt. Ophir. At Fraser Hill it was found only once (8767).

Polypodium cucullatum, Nees and Bl.; van Alderwerelt, p. 589, Ridley, p. 42, Beddome, p. 307.

Occurs on the hills of Ceylon and southern India at 3,000-5,000 feet, in Malaysia and Polynesia. In Java it is found as an epiphyte from the middle forest zone up to 9,000 feet. In the Peninsula it has been found on the Taiping Hills at 3,000 feet, and on the main range at Bujong Malacca and Bukit Kutu: the specimens so named from G. Tahan appear distinctly different. At Fraser Hill it was noticed only twice (8740), but is easily overlooked on account of its small size.

Polypodium subpinnatifidum, Bl.; van Alderwerelt, p. 590, Ridley, p. 42, Beddome Suppl., p. 86.

Recorded from the Peninsula, Java, and the Philippines (Copeland). In the Peninsula it has only been found on G. Kerbau, Ulu Semangkok and G. Tahan, but the distinction from

P. cornigerum does not seem well-marked. At Fraser Hill an epiphyte in the forest, abundant near Pine-tree Hill and at the highest point reached on G. Ulu Semangkok (8729).

Polypodium obliquatum, Bl.; van Alderwerelt, p. 600, Ridley, p. 42, Beddome, p. 311.

A common epiphyte in Ceylon, in southern India at 4,000-5,000 feet, in Malaysia and the Philippines. In the Peninsula apparently montane, having been collected on the Taiping Hills at 3,000 feet, at Temengo and Telom. At Fraser Hill it is an epiphyte in the forest (8782); observations as to its frequency are inadequate.

Polypodium mollicomum, Nees and Bl.; van Alderwerelt, p. 601; *P. fuscatum,* Bl., Ridley, p. 42, Beddome, p. 311.

This species is recorded from Ceylon and Malaysia. The specimens from Fraser Hill come nearest to it, but differ markedly from those from other localities, in the thinner translucent texture and great development of spreading hairs over the whole plant. Ferns from G. Tahan referred to *P. malaccanum* are in close agreement, differing from the type of the latter species from the top of Mt. Ophir. Other specimens referred to *P. mollicomum* are from G. Bubu and Kedah Peak. At Fraser Hill a fairly common epiphyte (8731).

Polypodium khasyanum, Hk.; van Alderwerelt, p. 603, Ridley, p. 42, Beddome, p. 308.

This species occurs on the Khasya Hills and in Assam at 3,000-4,000 feet, and in the Peninsula has been collected on the Taiping Hills at 4,000 feet, and on G. Pulai in Johore. At Fraser Hill it is an epiphyte, collected once only but possibly not infrequent (8486).

Polypodium serraeforme, J. Sm.; van Alderwerelt, p. 615; *Prosaptia Emersoni,* Pr., Ridley, p. 16, Beddome, p. 56.

Found on the hills of southern India and Ceylon, and through Malaysia to the Philippines and to Samoa. In the Peninsula it has been widely collected on the hills from Kedah Peak to G. Pulai in Johore, and at lower altitudes in Malacca and Selangor. At Fraser Hill collected by Mrs. Smith.

Polypodium contiguum, J. Sm.; van Alderwerelt, p. 616; *Prosaptia contigua,* Sw., Ridley, p. 17, Beddome, p. 56.

On the mountains of Ceylon and southern India and through Malaysia to Polynesia. In the Peninsula it has been collected on the Taiping Hills at 3,500 feet, at Telom, on Penang Hill at 2,000 feet, on G. Tahan, by the Tahan river and in Sungei Ujong. At Fraser Hill a fairly common epiphyte (8487).

Polypodium verrucosum, Wall.; van Alderwerelt, p. 619; *Goniophlebium verrucosum,* J. Sm., Ridley, p. 43, Beddome, p. 324.

Through Malaysia and the Philippines to New Guinea and Australia. In the Peninsula not confined to the hills, but collected from few localities. At Fraser Hill it is fairly common as an

epiphyte (8760), sometimes found growing beneath a larger fern, *Asplenium nidus* or *Pleopeltis heraclea*.

Polypodium argutum, Wall.; van Alderwerelt, p. 621; *Goniophlebium argutum*, Wall., Beddome, p. 323.

This species has a distribution in northern India and Luzon. Specimens collected at Fraser Hill in 1919 by Mr. C. Hose and at the Semangkok pass by Mr. Ridley have fewer pinnae than is normal but appear to be referable to it rather than to *P. amaenum* Wall.

Pleopeltis accedens, Bl.: van Alderwerelt, Suppl., p. 376, Ridley, p. 45, Beddome, p. 345.

From Malaysia to New Guinea and Polynesia. In the Peninsula an epiphyte of the hill forests, collected on the Taiping Hills at 3,000 feet, and on the main range from G. Kerbau to Ginting Sempah. At Fraser Hill it was found a few times, growing with *P. Wrayi* and *P. stenophylla* (10022).

Pleopeltis Wrayi, Beddome, Suppl., p. 93, van Alderwerelt, Suppl., p. 376, Ridley, p. 45.

This species has been recorded only from Sumatra and Borneo outside the Peninsula. It occurs on the Taiping Hills at 4,000-5000 feet on the main range from G. Kerbau to Fraser Hill, on G. Tahan and G. Benom. At Fraser Hill it is a common epiphyte (8462, 8488, 8733).

Pleopeltis peltata, Scort.; van Alderwerelt, Suppl., p. 376.

An endemic and montane species, closely allied to *P. superficiale* Bl., and no doubt originated locally from it. *P. peltata* has been found on the Taiping Hills at 3,000-4,000 feet, and on the main range at Telom and on G. Batu Puteh. At Fraser Hill it grows epiphytically in the forest, and was noticed two or three times only (8732).

Pleopeltis stenophylla, Moore.: van Alderwerelt, Suppl., p. 379, Ridley, p. 45, Beddome, p. 348.

In Malaysia, the Philippines and Fiji; in Java an epiphyte of the lower forest zone. In the Peninsula "high up on lofty trees in the low country, on rocks and low trees in the hills" (Ridley). It has been collected on Kedah Peak, on the Taiping Hills at 3,000 feet, at the Semangkok pass, in Johore and on the Islands of Penang and Singapore. At Fraser Hill a common epiphyte (8828).

Pleopeltis subcaudiformis, v. A. v. R., Suppl., p. 384. *Polypodium heterocarpum*, Mett. var. *abbreviatum*, v. A. v. R., p. 677.

Distribution, Malaya (van Alderwerelt). In the Peninsula collected only at Fraser Hill where it is one of the less common epiphytes. The identification is from description only (8834).

Pleopeltis platyphylla, Beddome, Suppl., p. 94, van Alderwerelt, Suppl., p. 386, Ridley, p. 46.

Confined to western Malaysia. In the Peninsula it is montane, having been collected on Kedah Peak, on the Taiping Hills, and

on the main range at Telom and Ginting Sempah. At Fraser Hill it was found once as an epiphyte (a small sterile specimen) and abundantly on the rocks of the mining valley near the stream (8768).

Pleopeltis rupestris, Moore; van Alderwerelt, Suppl., p. 387, Ridley, p. 46, Beddome, Suppl., p. 94.

An epiphyte, confined to Malaysia and the Philippines. In the Peninsula it has been collected only on the Taiping Hills at 3,000 feet and on G. Inas in Perak at 5,000 feet. At Fraser Hill only one small specimen was collected.

Pleopeltis incurvata, Moore; van Alderwerelt, Suppl., p. 399, Ridley, p. 47, Beddome, p. 364.

An epiphyte, confined to Malaysia and the Philippines. In Java it occurs in the lower forest zone. In the Peninsula it is montane, and has been found on Kedah Peak, the Taiping Hills, on the main range from Bujong Malacca to Bukit Hitam in Selangor, and on G. Tahan. At Fraser Hill it is abundant (8484).

Pleopeltis laciniata, Beddome, Suppl., p. 97, Ridley, p. 47, van Alderwerelt, Suppl., p. 399.

Confined to western Malaysia and Celebes. In Java it is an epiphyte of the lower and middle forest zones. In the Peninsula it has been found on the Taiping Hills at 3,500-5,000 feet, and on G. Tahan at 5,000-6,000 feet. At Fraser Hill it was found once only, on South Summits, on the ground in the forest (8815), but probably it is usually epiphytic.

Pleopeltis sp. nov. ? No. 8789. An epiphyte, found once only. It has a pinnatifid frond, like that of *P. laciniata,* but with more distant segments, and scattered superficial sori. Represented also in Mr. Hose's collection.

Pleopeltis heraclea, (Kze.); van Alderwerelt, Suppl., p. 403; *Drynaria heracleum,* Moore, Ridley, p. 45, Beddome, Suppl., p. 93.

Occurs throughout Malaysia and in New Guinea. In Java it is a common epiphyte of the lower, and less common in the middle forest zone. In the Peninsula it has been collected on the Taiping Hills at 3,000-4,000 feet, and on Penang Hill. At Fraser Hill it is a common epiphyte (8764), and was found also creeping over the rocks in the cleared mining valley.

Lecanopteris carnosa, Bl.: van Alderwerelt, Suppl., p. 407, Ridley, p. 10.

Confined to Malaysia and the Philippines. In the Peninsula this species is montane, and has been found on the Taiping Hills at 3,000-5,000 feet, on the Telom ridge, and on G. Tahan at 3,000-5,000 feet. Specimens from Singapore referred to this species have scaly rhizomes and medial sori, characteristic of *L. lomarioides.* At Fraser Hill branches of trees were frequently seen covered with the black tuberculous rhizome of this myrmecophilous fern, but well-developed fertile fronds were not often found (8728).

Cyclophorus flocciger, Pr.: van Alderwerelt, p. 687; *Niphobolus fissus,* Beddome, p. 330.

This species occurs on the hills of southern India and Ceylon, in northern India and Malaysia to the Philippines. It has not been definitely recorded from the Peninsula, and the present specimens (8470, 8769), whose fertile fronds are immature, are referred rather doubtfully to it.

Stenochlaena sorbifolia, J. Sm.; Ridley, p. 53, Beddome, p. 423.

A pantropical species, remarkable for the small and variable much-divided sterile leaves which are usually borne by the lower part of the climbing stem. It is distributed throughout the Peninsula and is very abundant at Fraser Hill (8459), but was never found with fertile leaves.

Hymenolepis spicata, Pr.; van Alderwerelt, p. 728; *Gymnopteris spicata,* Beddome, p. 432, Ridley, p. 54.

In Madagascar, Ceylon and southern India, northern India at 4,000-7,000 feet, to southern China, and through Malaysia to Polynesia and Australia. In Java it is found up to 10,000 feet. In the Peninsula it has been found on the Taiping Hills at 3-4,000 feet, on Kedah Peak, on the main range from Telom to Fraser Hill, and on Penang Island and Pulau Tiuman. At Fraser Hill it one of the less frequent epiphytes (8766).

Photinopteris speciosa Bl.: van Alderwerelt, p. 731; *P. rigida* Bedd; Ridley p. 55, Beddome p. 442.

Confined to Malaysia and the Philippines. In Java it is an epiphyte of the lower forest zone, at 1500 to 4000 feet. In the Peninsula "on boughs of trees, overhanging rivers and mangrove swamps" (Ridley); it has been collecteed in Singapore and Johore, on Penang Hill, and on the Taiping Hills at 300-2000 feet. At Fraser Hill it was found only in the mining valley, on rocks in the open (8845).

Cheiropleuria bicuspis Pr.; van Alderwerelt p. 732; *Chrysodium bicuspe* Hk., Ridley p. 55.

Occurring throughout Malaysia, extends to the Philippines, Formosa and New Guinea. In Java it is a rare ground fern, found at 5000 feet; in the Peninsula it is found on the Taiping Hills, on the main range from G. Kerbau to Fraser Hill, on G. Tahan and Mt. Ophir. At Fraser Hill found once only (8482), on the ground in the forest on North Ridge.

Leptochilus heteroclitus C. Chr.; van Alderwerelt p. 739; *Gymnopteris flagellifera* Beddome, p. 433, Ridley p. 54.

Generally distributed through tropical Asia, and through Malaysia to the Pacific. In the Peninsula found at low altitudes in Johore and Singapore, at Goping in Perak, and in Penang and Lankawi Islands; it grows in wet ground in forests. Mrs. Smith sent a small fertile specimen from Fraser Hill labelled "on log over stream, 4000 feet," which is probably referable to this species.

Ophioglossum pendulum L.; van Alderwerelt p. 777, Ridley p. 59, Beddome p. 465.

Occurs throughout southern Asia, Malaysia, Polynesia and northern Australia. In the Peninsula it is probably of general occurrence, but has only been collected on the Islands of Singapore and Penang, at Rawang in Selangor, and on G. Batu Puteh. At Fraser Hill it was noticed only twice, once hanging below *Asplenium nidus* (8761).

Angiopteris evecta Hoffm.; van Alderwerelt p. 762, Ridley p .58, Beddome p. 460.

Distrbuted from Madagascar, Ceylon and southern India, through northern India to southern China and Japan, and through Malaysia to Polynesia and Australia. In Java it is a common ground fern of the lower forest zone, and in the Peninsula is probably of general occurrence, but has only been collected on the Taiping Hills (up to 3000 feet), at Temengo and Telom, at Pekan, and on Singapore Island. At Fraser Hill, found only in the mining valley below 4000 feet, in shady places, becoming abundant at about 3500 feet (8847).

FERN ALLIES.

Selaginella atroviridis Spring; Ridley Fern Allies p. 153.

Distributed from British India and China to New Guinea, and collected from many localities in the Peninsula, from Perak to Singapore, not confined to the hills. At Fraser Hill it is abundant on the ground in the forest (8453).

Selaginella brachystachya Spring; Ridley Fern Allies p. 159.

In south India and Ceylon, and in western Malaysia. In the Peninsula it appears to be montane, being found on the Taiping Hills, at Telom, and on G. Tahan. At Fraser Hill noticed only by the path to the Gap. (8822).

Selaginella Wallichii Spring; Ridley Fern Allies p. 153.

Distributed from Assam through Malaysia to New Guinea. In the Peninsula collected at many localities in lowland forests, and on the hills up to 3-4000 feet. At Fraser Hill not abundant (8819).

Lycopodium cernuum L.; Ridley Fern Allies p. 144.

A species of worldwide distribution, abundant everywhere in the Peninsula. It is one of the first vascular plants to establish itself on new ground in exposed places, notably on levelled house-sites.

Lycopodium phlegmaria L.; Ridley Fern Allies p. 143.

Paleotropical, and in Queensland and New Zealand. In the Peninsula it has been found in many localities, at altitudes up to 5000 feet (G. Kerbau). At Fraser Hill it is frequent, but not abundant (8788).

MOSSES.

Acanthocladium scabrifolium Broth. No. 8730. "Agrees with the description quite well. It has only been found once before, in Java; cf. Hedwig. LX, 327 (1819). The fruit has never been described." (Dixon).

Braunfelsia sp. nov. No. 8838. The leaves are closely imbricated, and the plant having a tufted habit was saturated with water like a sponge. Found on a tree by the path to Pine-tree Hill.

Ctenidium sp. nov. No. 8715 d. Closely allied to *C. stereodontoides* Dixon from S. India.

Dicranoloma sumatrana Broth. This species, otherwise only known from Sumatra, was collected by Mr. Ridley at Sempang mines

Distichophyllum Mittenii Bry. jav. Nos. 8708, 8712. Distribution; Ceylon, Java, New Caledonia. Previously found on the Taiping Hills and Ulu Temengo in Perak, and at Kukub in Johore. On a log in deep shade in Reservoir Valley.

Ectropothecium Moritzii (C.M.) Jaeg. No. 8713. Distribution; Java, Borneo, Celebes. Collected also on Penang Hill and G. Tampin.

Endotrichella elegans (Doz. & Molk.) Fl. No. 8821. Distribution; Sumatra, Java, Celebes, Philippines. Previously found on the main range at G. Kerbau and Telom.

Isopterygium albescens (Schwaeg.) Jaeg. No. 9181. Distribution; Nilghiris, Himalayas from Nepal to Assam, Java, Borneo, Celebes, Japan. Previously found at Batu Caves, Selangor, and in the Botanic Gardens, Singapore.

Pogonatum convolutum (L.) var. **cirratum** (Brid.) Par. No. 8469. A new record for the Peninsula.

Pogonatum macrophyllum Bry. jav. No. 8467. Distribution; Java, Sumatra, Batjan. Apparently a montane species in the Peninsula being found on the Taiping Hills, on the main range from G. Berumban and Bujong Malacca to Bukit Hitam, on G. Benom, Mt. Ophir and the hills of Penang. Abundant at Fraser Hill

Pogonatum Neesii C. M. Nos. 8458, 8716. Found by Mr. Ridley at or near Fraser Hill, this species has not been recorded elsewhere in the Peninsula; it is known from the Nilghiris and Java. It is the first plant to colonise the bare ground of levelled house-sites and is very abundant.

Rhacelopus pilifer D. & M. No. 8772. Distribution; Tonkin, Java. Borneo. Batjan, New Guinea. This species is recorded from the Taiping Hills and from several points on the main range from Perak to G. Tampin. Not uncommon in the jungle on rocks and also on bare ground by paths.

Rhizognium spiniforme (L.) Bruch. No. 8468. Occurs everywhere in mountain forests of the tropics and subtropics, and

is widely distributed in the Peninsula from Kedah to Singapore, not confined to the hills.

Schistomitrium apiculatum D. & M. No. 8823. A Malaysian species, not recorded from other localities in the Peninsula. Collected on a tree in the forest on South Summits.

Sematophyllum sp. nov. No. 8711. Found on a tree in Reservoir Valley.

Sematophyllum secundum (Rw. and Hornsch.) var. **angustifolium** Fl. Nos. 8398, 8715 e, 8711, 8910. This variety occurs also on G. Raya, Lankawi Islands; at Fraser Hill it was abundantly fruiting. *S. secundum* is a Malaysian species, and has been found on G. Kerbau and Penang Hill.

Sematophyllum sigmatodontium (C. M.) Jaeg. Distribution; Java, Sumatra, New Guinea. This species was found by Mr. Ridley at or near Fraser Hill, and has also been collected on Penang Hill and on G. Tunduk, Malacca.

Taxithelium capillipes (Bry. jav.) Broth. No. 8454. Distribution; Sumatra, Java. It has been found on Penang Hill and in mangrove, amongst *Acrostichum aureum*, at Port Swettenham.

Trichosteleum Boschii (D. & M.) Jaeg. Nos. 8715 b, 8783. Distribution; Siam and western Malaysia. This species has been collected on the hills of Perak and Penang, in the Telok Reserve, Klang, and on G. Pantai in Johore.

Trichosteleum hamatum (D. & M.) Jaeg. Nos. 8709, 8715c, 8781. Distribution; Malaysia and the Philippines. New to the Singapore collection.

Trichosteleum sp. nov. No. 8715a. Found in Reservoir Valley, in a tuft consisting of *T. Boschii, T. hamatum*, etc.

Trismegistia rigida (Rw. & H.) Broth. No. 8399. A Malaysian species, extending to New Guinea and New Caledonia; it has also been found on G. Raya, Lankawi.

I. H. Burkill.
R. E. Holtum.

RAINFALL

at the Director's house, Botanic Gardens, Singapore, during the first half year, 1921.

Readings taken always at 8 a.m. and credited to the date in which the twenty-four hours began.

Date	January.	Feb.	March.	April.	May.	June.
1	.14	.02	nil	.87	.58	.38
2	.23	nil	..	.78	.10	.60
3	.64	.01	..	1.24	.65	.39
4	.02	.03	.11	nil	trace	.02
5	1.98	.97	.48	..	2.13	.47
6	.17	.17	.17	.85	nil	.11
7	.01	1.52	.09	.29	..	.02
8	1.35	.13	.06	.24	.15	.18
9	4.93	.05	1.60	.43	.79	.01
10	.78	.20	1.40	nil	.94	.03
11	.23	.13	.03	.07	.01	1.15
12	nil	2.92	1.55	.04	.01	.09
13	.01	.23	.53	trace	.02	.05
14	.23	.01	1.24	nil	trace	nil
15	.01	1.03	trace	.02	.44	..
16	nil	.01	nil	trace	.02	.11
17	..	trace	..	nil	.45	nil
18	.53	nil	..	1.11	.41	..
19	1.93	.02	..	.21	nil	..
20	1.12	.02	..	.55	1.58	..
21	1.27	nil	.10	.55	.29	..
22	.01	..	nil	nil	.23	.18
23	.01	trace	.52	..	.18	nil
24	nil	.18	.07	2.24	nil	.42
25	.13	.08	nil	.05	..	.02
26	nil	nil	.48	.55	.28	nil
27	..	..	.10	1.64	.02	.18
28	..	..	..	.03	nil	.05
29	.29		.30	.05	.01	nil
30	8.77		.02	.04	nil	..
31	.01		nil		nil	
	24.80	7.73	8.85	11.85	9.29	4.46

RAINFALL

at the Director's house, Botanic Gardens, Singapore, during the second half year, 1921.

Readings taken always at 8 a.m. and credited to the date in which the twenty-four hours began.

Date	July.	August.	Sept.	October.	Nov.	Dec.
1	nil	nil	1.86	trace	.07	.02
2	trace	..	1.08	nil	trace	nil
3	nil	trace	.58	trace	..	.37
4	..	.01	.02	nil	.28	.65
5	nil	.07	.03	..	2.74	.37
6	.91	nil	nil	..	trace	.39
7	.03	..	.06	..	nil	nil
8	.73	..	nil	..	.14	.05
9	.02	..	..	.62	trace	nil
10	trace	..	.27	2.26	nil	..
11	..	..	.03	nil	..	..
12	nil	.83	.05	.15	1.67	..
13	.51	nil	.02	nil	.37	..
14	2.49	.42	.03	.17	nil	.03
15	.06	.03	.22	nil	.29	.15
16	.02	nil	.01	.89	.40	.09
17	trace	1.04	.01	.06	.90	.08
18	nil	.06	.02	.91	trace	.48
19	..	2.15	2.07	1.42	..	nil
20	..	trace	trace	.15	2.03	1.05
21	..	.13	nil	.28	.03	nil
22	..	.01	..	nil	.03	trace
23	trace	nil	.29	.19	.06	nil
24	nil	.01	.07	nil	nil	..
25	..	.03	.57	.09	.36	.64
26	..	.11	trace	.08	.64	.03
27	.37	nil	1.20	.66	.33	trace
28	trace	..	1.50	.16	1.19	.12
29	nil	.01	.42	.87	.12	.03
30	..	1.56	nil	.06	trace	.38
31	..	.32		4.92		.23
	5.14	6.79	10.41	13.94	11.65	5.16

RAINFALL

at the Director's house, Botanic Gardens, Singapore, during the first half year, 1922.

Readings taken always at 8 a.m. and credited to the date in which the twenty-four hours began.

Date	January.	Feb.	March.	April.	May.	June.
1	.01	1.12	.11	nil	.01	.52
2	nil	.24	.96	.11	nil	1.57
3	.04	.09	.01	nil	trace	nil
4	.44	nil	.16	.06	.06	..
5	.12	1.04	.08	nil	trace	..
6	.02	nil	nil	trace	nil	trace
7	.64	..	..	1.01	..	nil
8	trace	.49	.20	nil	..	.01
9	.23	.34	.12	..	2.76	nil
10	nil	.49	.84	.11	.24	.21
11	.62	2.69	.07	.11	nil	.01
12	.01	.02	nil	1.24	trace	trace
13	nil	1.06	.81	.06	.06	.09
14	.11	.07	.07	.36	.01	.01
15	.32	nil	nil	1.26	.77	.18
16	trace	..	..	.15	trace	.19
17	..	trace	.47	1.38	.06	trace
18	.53	nil	.14	.04	3.06	.09
19	.10	..	nil	.29	.02	.04
20	1.39	..	.02	nil	1.08	.32
21	1.02	..	.04	trace	nil	.11
22	.21	..	.10	nil	.07	.03
23	.12	trace	.88	trace	.50	3.89
24	.93	.01	.39	nil	trace	.02
25	.10	.08	1.84	..	.18	trace
26	nil	.07	.02	..	nil	nil
27	..	.20	.32	..	1.49	trace
28	trace	.20	.01	..	.03	nil
29	nil	..	.20	..	.01	..
30	..	..	trace	.17	trace	..
31	..	..	nil	..	nil	..
	6.96	8.21	7.86	6.35	10.41	7.29

RAINFALL

at the Director's house, Botanic Gardens, Singapore, during the second half year, 1922.

Readings taken always at 8 a.m. and credited to the date in which the twenty-four hours began.

Date	July.	August.	Sept.	October.	Nov.	Dec.
1	nil	.14	nil	1.05	1.00	.01
2	..	.26	trace	.05	.09	.06
3	.05	nil	1.96	.31	.93	.62
4	.50	..	trace	.04	trace	nil
5	.06	..	nil	1.35	.11	..
6	.01	.43	.16	.09	.78	1.49
7	.90	trace	trace	.01	.05	1.12
8	.02	nil	1.53	.18	nil	trace
9	.08	.41	.04	trace	.04	nil
10	.03	nil	nil	nil	.07	.65
11	nil	.09	.02	.04	.25	.07
12	..	.47	nil	nil	.01	nil
13	.02	.16	..	..	.23	.23
14	.23	.92	..	..	nil	.01
15	.82	.15	..	..	..	.08
16	nil	.05	..	..	..	.91
17	..	.61	..	.68	.27	.03
18	.28	nil	..	nil	2.91	.20
19	.01	..	..	..	.11	1.05
20	nil	.08	..	.02	.43	.01
21	..	.80	..	.34	trace	.41
22	trace	.53	..	.40	nil	.16
23	nil	1.73	..	1.45	.02	nil
24	..	.52	.52	.74	2.39	.59
25	trace	3.72	.86	nil	trace	nil
26	nil	2.66	nil	.09	.81	..
27	..	.02	1.56	.08	.35	.01
28	..	.19	trace	trace	.35	nil
29	..	.04	1.48	nil	.72	..
30	..	1.10	1.28	..	1.33	..
31	..	.08	..	.40	..	.59
	3.01	15.16	9.41	7.32	13.25	8.30

RAINFALL

at the head of the Waterfall Gardens, Penang, during the first half year, 1921.

Readings taken at 8 a.m. and credited to the date in which the twenty-four hours began; the registration kindly put at the service of the Gardens by the Municipality of George Town, Penang.

Date.	January.	Feb.	March.	April.	May.	June.
1	nil	.05	nil	.06	nil	.15
2	.70	1.12	..	nil	.15	.75
3	.14	.03	.14	..	.35	.03
4	.04	nil	.18	..	1.60	nil
5	.10	.43	nil	..	.92	2.07
6	.06	nil	..	..	.42	.03
7	.10	..	.10	..	.11	nil
8	.08	..	.19	..	.10	..
9	.03	..	.04	..	nil	1.86
10	nil	..	1.82	..	.70	nil
11	.04	..	.57	.46	.33	..
12	1.73	..	1.05	2.20	nil	.03
13	nil	..	1.24	.15	1.46	nil
14	1.83	..	.25	.72	1.05	..
15	nil	1.43	.23	nil	1.97	.04
16	..	nil	.33	.65	.50	.82
17	..	..	.22	1.99	3.14	nil
18	.25	..	.08	.62	.58	..
19	.06	..	2.60	.16	1.83	..
20	nil	1.59	.42	.04	.17	..
21	..	nil	1.98	nil	.16	..
22	..	..	.12	..	.06	.06
23	..	..	.53	..	nil	nil
24	..	..	.03	..	.02	..
25	..	..	.76	..	1.09	.34
26	..	..	.05	..	nil	.03
27	..	..	.16	1.30	.12	nil
28	..	..	.07	.19	..	..
29	.88		nil	.84	..	..
30	.06		..	.04	.05	..
31	nil		.57		.09	
	6.10	4.65	13.73	9.42	16.97	6.21

RAINFALL

at the head of the Waterfall Gardens, Penang, during the second half of the year, 1921.

Readings taken at 8 a.m. and credited to the date in which the twenty-four hours began; the registration kindly put at the service of the Gardens by the Municipality of George Town, Penang.

Date.	July.	August.	Sept.	October.	Nov.	Dec.
1	.05	.53	.82	.10	.62	nil
2	nil	.10	2.25	.23	2.50	..
3	..	nil	nil	.01	nil	..
4	.05	1.46	..	.07	..	1.69
5	5.02	.07	..	.07	.28	..
6	.33	nil	.97	1.68	.03	.19
7	nil	..	nil	nil	.18	nil
8	.22	..	..	.10	.04	..
9	.04	..	..	.02	.16	..
10	.14	..	..	.04	2.42	.32
11	nil	..	..	nil	.72	nil
12	1.56	..	3.60	.44	.02	..
13	.30	..	.11	.21	..	..
14	1.07	.95	.67	.33	1.38	..
15	.39	.68	5.66	.72	nil	..
16	.56	3.50	.31	1.87	..	..
17	.60	1.12	.36	1.02	..	..
18	nil	.02	2.55	1.79	.21	..
19	..	.59	2.85	1.44	.03	.41
20	.03	nil	1.33	nil	.20	.36
21	nil	..	nil	..	.08	nil
22	..	..	.25	.70	nil	..
23	..	..	.13	.96	..	..
24	..	..	nil	.43	.14	..
25	..	.58	.03	.19	.06	..
26	..	nil	1.89	.23	nil	.77
27	.06	.06	1.08	.42	..	.42
28	.80	.08	1.60	nil	.15	.20
29	nil	1.55	nil	1.84	nil	.05
30	.30	2.45	.01	.52	.22	nil
31	1.63	4.82		.81		..
	13.15	18.56	26.47	16.24	9.44	4.41

RAINFALL

at the head of the Waterfall Gardens, Penang, during the first half year, 1922.

Readings taken at 8 a.m. and credited to the date in which the twenty-four hours began; the registration kindly put at the service of the Gardens by the Municipality of George Town, Penang.

Date.	January.	Feb.	March.	April.	May.	June.
1	nil	.07	.91	nil	1.60	.19
2	..	.12	.06	..	.76	nil
3	..	.48	.51	..	.02	.35
4	.77	.06	.79	..	.74	.18
5	nil	.30	nil	.03	.85	.96
6	..	nil	.83	nil	nil	.05
7	..	..	nil	1.40	3.94	nil
8	..	..	.16	.11	2.95	..
9	.13	.15	nil	.69	.60	..
10	nil	.39	..	.04	.02	..
11	.11	nil	..	.80	1.62	..
12	nil	.30	..	.21	.05	..
13	..	nil	.01	.30	.42	.64
14	..	..	.03	.34	.05	.07
15	.81	..	.90	.22	.54	.29
16	nil	..	.60	.50	nil	2.15
17	.90	..	1.06	.13	.13	1.18
18	.04	..	.57	.46	.43	2.28
19	.27	..	.13	nil	.19	1.70
20	nil	..	.01	..	.03	.31
21	.07	..	2.43	..	.02	.12
22	.04	..	.02	..	nil	.35
23	nil	.20	1.25	.10	.12	nil
24	..	nil	1.29	nil	nil	..
25	..	.27	.22	..	.58	..
26	..	.21	nil	..	nil	..
27	..	.41	..	..	.49	..
28	..	nil	..	..	.02	..
29	..		..	.03	.16	.48
30	..	..	..	.22	nil	.07
31	..		..		1.92	..
	3.14	2.96	11.78	5.58	18.25	11.37

RAINFALL

at the head of the Waterfall Gardens, Penang, during the second half of the year, 1922.

Readings taken at 8 a.m. and credited to the date in which the twenty-four hours began; the registration kindly put at the service of the Gardens by the Municipality of George Town, Penang.

Date.	July.	August.	Sept.	October.	Nov.	Dec.
1	.05	nil	.36	1.14	.10	nil
2	2.17	..	1.55	.02	.50	1.05
3	nil	..	.77	.27	.90	.08
4	.18	..	.29	.55	1.22	.58
5	.02	.21	nil	.03	.40	.09
6	nil	.03	..	.32	.08	1.37
7	.10	.04	1.30	.03	.35	nil
8	nil	nil	.50	.23	.23	..
9	..	..	.45	.25	.14	..
10	.17	3.24	nil	.60	.23	.22
11	nil	1.73	.23	.17	1.25	.17
12	.56	.33	1.11	2.56	.62	nil
13	1.62	.07	.32	.04	5.66	.25
14	.02	nil	nil	.10	.53	nil
15	nil	1.00	.82	.02	.32	.24
16	.52	.05	.42	.47	.77	1.62
17	.96	nil	.41	.08	.04	.07
18	.11	..	1.14	.66	nil	.75
19	nil	.55	nil	nil	.25	1.80
20	..	4.30	..	..	..	1.00
21	..	nil	..	.55	..	1.03
22	..	.02	..	.56	.05	.50
23	.20	.32	.92	.08	.22	nil
24	nil	.12	2.06	.38	.10	.70
25	..	nil	2.60	.16	nil	nil
26	..	.43	2.53	.29	.20	.12
27	..	nil	2.09	.27	.42	nil
28	..	1.44	.35	.87	nil	.06
29	..	nil	nil	.09	..	.92
30	..	..	.91	nil	.66	nil
31	..	..		..		1.70
	6.68	13.88	21.13	10.79	15.24	14.32

SUMMARY OF RAINFALL, 1921.

	SINGAPORE.			PENANG.		
	No. of rainy days.	Amount of rain in inches.	Longest Spell without rain.	No. of rainy days.	Amount of rain in inches.	Longest Spell without rain.
January ..	24	24.80	3	15	6.10	9
February ..	19	7.73	3	6	4.65	9
March ..	18	8.85	5	25	13.73	2
April ..	21	11.85	2	14	9.42	9
May ..	21	9.29	2	24	16 97	2
June ..	19	4.46	5	12	6.21	5
July ..	9	5.14	10	18	13.15	6
August ..	16	6.79	6	16	18.56	8
September ..	22	10.41	3	19	26.47	5
October ..	17	13.94	8	26	16.24	2
November ..	18	11.65	3	19	9.44	3
December ..	18	5.16	5	9	4.41	8
Total ..	222	120.07	..	203	145.35	..

Greatest amount in 24 hours ..	8.77	5.66
do. do. 48 do. ..	9.06	7.27
do. do. 72 do. ..	9.07	8.82

Excessively rainy periods, more than 5.00 in. having fallen in 72 hours. (both in January)	.. 2	5 (March, July, August) (twice) and September)
No. of days when the condition existed	.. 6	15
Periods of comparative drought, less than 0.02 in. having fallen in 120 hours (Feb, June, June-July, July, July-August, September, October, December.)	.. 8	12 (every month except May, October and Nov.)
No. of days when condition persisted	.. 22	36
Longest of the dry spells	.. 10 days	10 days.

SUMMARY OF RAINFALL, 1922.

	SINGAPORE.			PENANG.		
	No. of rainy days.	Amount of rain in inches.	Longest spell without rain.	No. of rainy days.	Amount of rain in inches.	Longest Spell without rain.
January ..	19	6.96	6	9	3.14	9
February ..	16	8.21	9	12	2.96	10
March ..	23	7.86	2	19	11.78	10
April ..	14	6.35	10	16	5.58	5
May ..	17	10.41	4	25	18.25	1
June ..	16	7.29	6	17	11.37	6
July ..	13	3.01	12	13	6.68	12 (to Aug. 4)
August ..	23	15.16	2	16	13.88	3
September ..	10	9.41	12	21	21.13	4
October ..	18	7 32	5	27	10.79	2
November ..	22	13.25	3	24	15.24	2
December ..	20	8.30	3	21	14.32	3
Total ..	211	103 53	..	220	135.12	..

Greatest amount in 24 hours ..	3.89	5.66
do. do. 48 do. ..	6.38	6.89
do. do. 72 do. ..	6.91	7.53

Excessively rainy periods, more than 5.00 in. having fallen in 72 hours ..	1	5 (May, June, August September, November)
No. of days when the condition existed ..	3	10.
Periods of comparative drought, less than 0.02 in. having fallen in 120 hours ..	8	7 (January, February, March, April. April, June (2), July-August).
(Jan., Feb., April, June (2), July, Sept, Oct.)		
No. of days over which the condition existed	35	30.
Longest of the spells ..	12 days.	12 days.

Departmental Notices.

A list of plants which can be purchased at the Botanic Gardens, in Singapore and in Penang, can be had upon application. The same list appears at intervals in the Government Gazette.

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